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THE INTERIOR OF CANADA

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Branch—E. F. DRAKE, Superintendent

REPORT OF THE PROCEEDINGS OF THE  
ELEVENTH ANNUAL CONVENTION  
OF THE  
WESTERN CANADA  
IRRIGATION ASSOCIATION

HELD AT

MAPLE CREEK, SASKATCHEWAN

August 1, 2 and 3, 1917

Published by the authority of the Hon. A. MEIGHEN,  
Minister of the Interior.

OTTAWA

J. DE LABROQUERIE TACHÉ  
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY  
1918

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Delegates to the Convention.



# DEPARTMENT OF THE INTERIOR OF CANADA

Hon. A. MEIGHEN, Minister; W. W. CORY, Deputy Minister

Irrigation Branch—E. F. DRAKE, Superintendent

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### PREVIOUS CONVENTIONS.

CALGARY, Alberta, 1907.

VERNON, British Columbia, 1908.

LETHBRIDGE, Alberta, 1909.

KAMLOOPS, British Columbia, 1910.

CALGARY, Alberta, 1911.

KELOWNA, British Columbia, 1912.

LETHBRIDGE, Alberta, 1913.

PENTICTON, British Columbia, 1914.

BASSANO, Alberta, 1915.

KAMLOOPS, British Columbia, 1916.



## THE WESTERN CANADA IRRIGATION ASSOCIATION.

### OFFICERS FOR THE YEAR 1916-17.

Hon. Patron—His Royal Highness The DUKE OF CONNAUGHT AND OF STRATH-EARN, K.G., K.T., K.P., G.C.B., etc.

Hon. President—Hon. W. J. ROCHE, Minister of the Interior, Ottawa.

First Hon. Vice-President—Hon. DUNCAN MARSHALL, Minister of Agriculture, Edmonton, Alberta.

Second Hon. Vice-President—Hon. T. D. PATTULLO, Minister of Lands, Victoria, B.C.

President—Hon. W. R. MOTHERWELL, Minister of Agriculture, Regina, Sask.

First Vice-President—Hon. H. BOSTOCK, Ducks, B.C.

Second Vice-President—G. R. MARNOCH, President Board of Trade, Lethbridge, Alberta.

### EXECUTIVE.

R. G. WILLIAMSON, Chairman, Maple Creek, Sask.

JAS. L. BROWN, Kamloops, B.C.

A. S. DAWSON, Calgary, Alberta.

JAS. JOHNSTONE, Nelson, B.C.

F. H. PETERS, Calgary, Alberta.

W. E. SCOTT, Victoria, B.C.

W. D. TREGO, Gleichen, Alberta.

E. E. R. WOLLASTON, Vernon, B.C.

ROBERT J. C. STEAD, Acting Secretary, Calgary, Alberta.

### LOCAL BOARD OF CONTROL.

P. CHEVALIER, Chairman.

D. J. WYLIE, Vice-Chairman.

MAT FLEMING.

R. H. HODSON.

W. J. REDMOND.

R. G. WILLIAMSON.

JOHN DIXON.

F. H. AULD.

C. H. STOCKDALE.

G. S. HERRINGER, Secretary.





REPORT OF THE PROCEEDINGS  
OF THE  
ELEVENTH ANNUAL CONVENTION  
OF THE  
WESTERN CANADA IRRIGATION ASSOCIATION  
HELD AT MAPLE CREEK, SASKATCHEWAN  
ON  
AUGUST 1, 2, AND 3, 1917.

OPENING SESSION—WEDNESDAY, AUGUST 1, 1917, 9.30 a.m.

The Eleventh Annual Convention of the Western Canada Irrigation Association opened in the Armouries at Maple Creek, Sask., on Wednesday, August 1, 1917.

The chair was taken by the President, the Honourable W. R. Motherwell, Minister of Agriculture, Regina, Sask.

In calling the convention to order, the chairman said: Ladies and Gentlemen, I would like to make an explanation on account of the Lieutenant-Governor of this province. He was very anxious indeed to formally open this convention but found himself at the last moment unable to attend. I now formally call this convention to order and before we proceed further we will all rise and sing "God Save the King."

The singing of the National Anthem was followed by an invocation led by the Rev. T. J. Davies, of Maple Creek.

The CHAIRMAN: The next item on the programme is a word from His Worship Mayor Chevalier.

Mayor CHEVALIER: It is a pleasure to me to be here this morning to give a few words of welcome to the speakers and delegates and friends of the Western Canada Irrigation Association. It is quite an honour to have you with us to-day, because it is the first convention of this association in Saskatchewan. I hope this convention will have good results in furthering irrigation and agriculture. I am pleased to extend to you a welcome to our city.

The CHAIRMAN: On behalf of this convention I will express the thanks of this association to His Worship and we will take advantage of it as much as possible and we will also hope to get the utmost advantage out of the good offices of His Worship. I thank you on behalf of the convention at this time.

The next item on the programme is the chairman's address. You will remember that at the last convention I was honoured by being appointed president of the Western Canada Irrigation Association. I am sure it was not because of my practical knowledge of irrigation that I was appointed to this position, but I accepted it to show my sympathy with any movement tending to advance agriculture. The world situation to-day requires that we should be interested in whatever will promote and increase the production of the world's food supply. Because irrigation tends to promote agriculture very many of us are here to-day. I really did not expect to be here to-day as I was rusticated in Banff for the past two weeks and up to last evening. However, I got a hurry call to come down here, and notwithstanding the fact that the mountains seemed to hold me, I came. I, myself, have no knowledge



of the practical side of irrigation, but I have come in contact with it in Western Canada and the United States to some extent and also have acquired some knowledge through what I have read of irrigation.

It may be of interest to state that over half of the world's arable area has insufficient moisture to produce crops each year. That is, nature has to be helped by artificial means to produce crops on over half the world's arable land. So, the supply of water is in many cases the limiting factor to successful agriculture. In some lands, such as European countries, where the farms are of a very small area, some consisting of but one, two or five acres, land is the limiting factor to successful agriculture because the smallness of the area of the farm precludes the use of labour saving machinery.

Some little time ago, before the world devastating war commenced, I went through parts of Europe and I saw farms so small indeed that it seemed an athlete could readily jump across some of them. Some of us who were in this country twenty or thirty years ago will remember when the distance from market was the limiting factor. A man twenty or forty-five miles from markets can handle only a certain amount of grain, as it will take too long to haul a large crop to town, so that in some agricultural districts distance is the limiting factor. It may be that transportation by rail or water is the limiting factor. For instance, in Australia at the present time ocean transportation is the limiting factor to wheat growing. Then in other districts the question of fertility is the limiting factor. None of these, however, to any extent, is the limiting factor to field agriculture in Western Canada. What is it then? We cannot say generally it is lack of transportation or the distance from market or the question of fertility, but usually it is the question of water supply for purposes of field agriculture.

We have two ways of supplementing nature and making the farmer more independent of cloud moisture. One is by irrigation and another is by dry farming. Now, as I have just stated, over fifty per cent of the arable area of the world has to be helped out by some one form or application of either of these methods. In a year like this and the year 1914 we have had to rely upon sources of water supply other than cloud moisture in order to ensure a successful crop; but despite this fact I have heard practical men say that they were not going to farm for a dry year. They were going to farm for a wet year and take a chance of it being a dry season. I think that is a fallacious practice to follow in this or in any other similar country. Some of the old-timers will remember that the outstanding dry years were 1886, 1889, 1900, 1910, 1914, and the year we are in (1917), and in seasons such as those it is impossible to grow an average or paying crop without irrigation or storing up moisture from the previous year. This year has again demonstrated the fact that we have to resort to one of these devices to assist nature in developing the agricultural resources of this land. I have not been able to decide that these dry years come in cycles. I do not think they come with any regularity. The point is, we should cultivate our land so well as to be prepared for the worst and then hope for the best. The last time I was here in Maple Creek at a convention there arose a controversy over the relative merits of irrigation and dry farming. Now, I think there should be none. They both aim to make the farmer more independent of the cloud moisture in the particular crop year he is in.

Now, I understand some people object to irrigation because it means a lot of work. The question of excessive work does not appeal to the western man. Some of us left our homes in the eastern part of Canada, not because of irrigation, but for the reason that we did not like the constant work and chores entailed on a live stock farm. We came west expecting to work less. But I have found no country under the sun where if you are to succeed in agriculture it does not mean constant work and work applied properly and at the right time. And if irrigation gives the desired results this objection may be ruled out. Then there is the question of cost to which some people object in connection with irrigated lands, but if the profits are relatively greater this objection is unimportant. Another objection is, that going over



the irrigation ditches wrecks the farm machinery. I think they get over this difficulty pretty well by levelling wherever possible. Then, I understand another objection is, that the water is too cold when taken direct from the rivers which have their sources in the mountains. This, however, has not been proven to be the case. On the contrary, the water from the great reservoirs should be quite warm enough by the time it is applied to the land, and I understand this has been demonstrated to be the case. Then, it is said that mineral deposits are brought down by the water to the soil. The western streams are, however, particularly free from such deposits. I have the testimony for this from many irrigationists. I am not going to say anything about the original cost of irrigation as I am not familiar enough with that phase and I will leave it to some others to discuss.

On the other hand, objections are heard to dry farming. We get crops only twice in three years, and in some districts only every other year. Then we have a large part of our land under summer-fallow—lying idle—and that makes farming more expensive. Then the process of summer-fallowing burns up the vegetable matter in the soil. The more we summer-fallow and keep the soil warm and open, the more we exhaust the humus and the nitrates. Unless these are returned to the soil our clay land will become harder and stiffer to work as time goes on. Another objection to dry farming is that it is conducive to soil drifting. The harder and stiffer the clay soil becomes and the less humus that remains in it the more it will drift the year after it is summer-fallowed. That is incredible to many people who think that only light land will drift. We find that heavy land after summer-fallowing will drift badly, and the soil which blows away is the richest and best of it. This drifting, however, while very serious, can be more or less overcome by right tillage and rotation methods.

Dry farming tends to extensive farming. It means holding a large portion of the land, even one-third of it, idle for summer-fallowing, if we are to farm successfully in dry districts. That, in turn, develops large farms but with sparse population and makes for expensive municipal government, expensive road construction, expensive construction of bridges, schools and churches. All these local conveniences owing to the sparseness of population in most districts are more expensive than they would be to the average farmer if we had closer settlement and larger population. On the other hand, irrigation farming tends to intensive development, more grass, more pasture, more hay, more live stock, possibly more fencing, more tree culture, smaller farms, more population. You will agree that this is a strong argument in favour of irrigation and here let me say that no matter what our success may be on the open prairie it falls far short of home building if we do not plant trees. One of the loneliest sights I can imagine is a prairie home without trees. And with proper tillage we can grow them abundantly.

These are some of the conditions which irrigation should produce and the more it increases the live stock, the more profitable in the end will be our farming. I know that this picture may not appeal to the wheat-grower who comes to us with large ideas and wants to farm by the township, but far more of us are trained to farm on a comparatively small scale. Farming successfully on a large scale depends mainly upon two things. One is a good knowledge of mechanical power, and the other is how to get the best results out of a gang of farm labourers and many of us are not gifted in either of these two important essentials, hence a smaller farm may suit our requirements much better.

No matter how enthusiastic you irrigation or dry farmers may be, I think you will agree that probably the best method to follow, where possible, is to combine both irrigation and dry farming on the one farm. That removes an objection some people have to some of the farms now under irrigation in Western Canada where they say one can only irrigate a portion of the farm owing to its undulating character. People who have spoken to me about this tell me that the best system is to have about fifty per cent under irrigation and the remainder devoted to dry farming methods. The irrigated area then is devoted to the growing of hay, grass, alfalfa and vegetables. I

wonder if any of the persons here think we can grow alfalfa or grass every year on the same land under dry farming methods. We can grow a particularly fine crop of hay the first year under dry farming methods, but I do not think the greatest dry farming enthusiast will claim that he can grow grass or hay crops successfully year after year on the same field. This is not naturally a hay country. The precipitation is too light. The average precipitation in this particular district is only about fifteen or sixteen inches per year. Consequently, to grow hay or pasture to the greatest success in consecutive years you must have irrigation. Then the other fifty per cent of your farm may be devoted to dry farming methods. I do not think that irrigationists claim you can grow better wheat on irrigated farms. If, under such conditions, you use your irrigated land for growing wheat, I believe you are not making the best use of your opportunities. Consequently, a man situated so that half of his farm is capable of irrigation and half for dry farming is in a position to have the ideal conditions for successful diversified agriculture.

A word as to methods, and this applies equally to dry farming and irrigation. It seems to me that all the evidence points to the fact that we must take more care with our farming practice. But, if there is one reason why we should farm well in times of peace, there are ten reasons why we should farm better in times of war. Take the fact that farmers have been getting \$2.40 for their wheat. That is so much more than we dreamed of years ago that we are now attempting to put all the ground we possibly can into the growing of wheat and we have been doing it all too generally and without adequate preparation. If we continue this practice I fear we are later going to regret it. If this crisis should only last one year, we might afford to throw all our efforts and all our land into the raising of wheat, but since no man knows when the war will be over, we should take more care than we have ever taken to have our work done properly and at the right time.

So far as I am aware, nearly every person who has been discussing the subject of after-the-war prices holds the view that low prices are going to prevail when the war is over. I do not see how any one is justified in coming to that conclusion. With the present methods of cultivation and the practice of growing as much as possible the soil is naturally depleted and deteriorated and the yield becomes lighter. Therefore, the price of grain should remain high for several years after the war.

The land in Europe had to be fed up almost as carefully as a milch cow and it is not being fed up to-day and, therefore, for the want of artificial fertilizers and for the want of ordinary farm manure, because live stock is being also depleted, the land in Europe is yearly getting in a poorer condition to raise crops. In this country it will not work out in the same way simply because the question of fertility is not yet a limiting factor. But in the older districts, the condition of our soil is going from bad to worse from weed infection. You will find fields in the newer localities half of which is native quack grass on account of continued stubble cropping. So far as I can see, therefore, with the present agricultural methods prevailing, due partly also to labour shortage, agriculture will be in such a rundown condition generally by the time the war is over that it will take a long time afterwards to again attain our maximum average production. These conditions will naturally affect supply and prices and the man who farms carefully and well should be well rewarded during the next few years. Altogether too many people are scrambling into grain growing just now and putting more land in wheat than they can rightly cultivate. They think that they will make sufficient while high prices prevail to tide them over the days when the prices will be low. This is an absolutely wrong idea and I do not see how that conclusion is in the least justified. We want maximum production and many are striving to attain it by boosting the acres rather than by boosting the bushels. Practise continuity in farming as in other callings. Do not farm with the idea that you are going to farm only for to-day. Keep firmly in mind that only with continuity in farming shall we attain the best degree of production and success.



I have a suggestion I would like to make before I conclude. The matter of establishing illustration farms in irrigated areas is one which I think you should have the Government deal with. As you probably know, the Federal Government has been establishing illustration farms of about forty acres under the direction of Mr. Grisdale. I want to express my appreciation of this work. We began similar work in 1914, before the outbreak of the war. Our district representatives were supplying certain farmers with seed and giving instructions both written and verbal on how to meet conditions for just this sort of year. However, most of our young men enlisted and went to the front and we have only one illustration farm left now at Battleford. I regret that for the lack of men and money we have not been able to develop this work as we had planned. However, the Dominion Government also is doing this class of work and has an illustration farm at Shaunavon, one near Cabri, and one in this district, and many others elsewhere. But these farms have been located in the dry farming districts to teach dry farming methods. There are also the larger experimental farms like Indian Head, Scott, and the Lacombe Farm. These also were started to show how dry farming should be conducted. In Lethbridge, I believe, Mr. Fairfield has been instrumental in having the experimental farm at that point, or at least a portion of it, worked under irrigation conditions. My suggestion to you would be that the Dominion Government, having greater resources, should, as a national movement, establish at least two or three experimental or illustration farms in irrigated districts.

Years such as this demonstrate the value of irrigation, but what we most need is expert advice and demonstration of the methods, which after due experimentation, have been found of greatest value for irrigation farmers to follow. If, therefore, the Government would take up this work and experiment and demonstrate for men who have not the practical knowledge or experience of irrigation under our conditions, their efforts would certainly result in much good. (Applause.)

I now call upon the Acting Secretary, Mr. Stead, to read his report.

### SECRETARY'S REPORT.

MR. STEAD: Mr. Chairman, Ladies and Gentlemen,—In presenting to you the secretary's report of the affairs of the Western Canada Irrigation Association for the season 1916-17, it is appropriate that reference should be made to the satisfaction felt by the executive, and by all who have the interests of irrigation at heart, that the province of Saskatchewan has found its irrigation interests to be so great as to justify it in inviting and entertaining this convention at Maple Creek.

As is well known to the members of this association, the permanent secretary, Mr. Norman S. Rankin, is enlisted with the military forces of Canada. At the Kamloops Convention Mr. Rankin tendered his resignation in order that he might carry out his military purposes, but the executive, very wisely, I think, declined to accept his resignation, granting him instead leave of absence for such period as might be necessary, and in order that the work might be carried on uninterruptedly I was asked to act as acting secretary during that period.

### RESOLUTIONS.

At the convention held at Kamloops, B.C., July 25, 26 and 27, 1916, certain resolutions were passed, as will be found quoted on page 194 and following pages of the Report of the Tenth Annual Convention. These resolutions were duly drawn to the attention of the authorities and persons interested therein, and acknowledgment thereto received from the proper parties.

## ANNUAL REPORTS.

Owing to the fact that the report of the Bassano Convention was not available for distribution until after the Kamloops Convention, two annual reports have been distributed within the last twelve-month period. These reports are sent to the delegates in attendance and to a mailing list of farmers and others known to be interested in irrigation, and also to the leading newspapers throughout the West.

## ORGANIZATION.

The officers elected at the Kamloops convention have continued in office during the year with the exception of the Hon. W. R. Ross, who was elected to the position of second hon. vice-president, but who subsequently resigned with the suggestion that his successor in the office of Minister of Lands of the province of British Columbia, Hon. T. D. Pattullo, should be appointed to this position. With the concurrence of the executive this was done.

Mr. F. H. Peters, Chairman of the Executive Committee, also found it necessary to tender his resignation as chairman of the committee, on account of other duties, and Mr. R. G. Williamson was elected chairman in his place.

In order to effect a local organization at Maple Creek, Mr. Peters and the acting secretary attended a meeting in that town on March 16, when the following Board of Control was elected by a representative gathering of business men and farmers of Maple Creek district:—

Chairman, P. Chevalier, Mayor of Maple Creek.

Vice-Chairman, D. J. Wylie, M.L.A.

Secretary, G. S. Herringer.

Chairmen of Committees:—

Mat Fleming.

W. J. Redmond.

John Dixon.

C. H. Stockdale.

R. H. Hodson.

R. G. Williamson.

F. H. Auld, Deputy Minister of Agriculture, Regina, was appointed ex-officio a member of the local Board of Control.

A meeting of the executive committee was held at Banff on Friday, August 27, to prepare a programme for the Maple Creek Convention and for other organization purposes. At this meeting Col. C. S. McInnis and R. J. Burley were appointed to represent the association at the meeting of the International Joint Water Users' Commission at St. Paul in May.

Resolutions of appreciation of the action of the permanent secretary, Mr. Norman S. Rankin, in enlisting for service at the front were passed and copies forwarded to Mr. Rankin and also to Mrs. Rankin.

## PUBLICITY.

Every effort has been made to keep the work of the association and general interests of irrigators in Western Canada before the public through the press. As the addresses delivered at the annual conventions are usually too lengthy to be reprinted in full in most newspapers, the secretary undertook to abbreviate a number of them and to obtain circulation for them in that way. In addition to regular articles a stream of short items was provided to the newspapers dealing with different



ases of the association's work, and drawing attention particularly to the present convention at Maple Creek. In this connection the association is deeply indebted available the press for the generous publicity given to this convention. Clippings on file, ve been which are available for your examination, show that a circulation of 917,840 has he been secured, and in addition to this, it is always the case that many items are terested published of which no clippings are secured.

The official call was mailed late in June to a list of over 2,000 irrigators and others interested, and was followed by a set of three follow-up post cards prepared from original drawings made for the purpose. The cards were also distributed widely to the press and drew forth considerable comment. Another form of publicity used was the distribution to the newspapers of cuts, which had been made at the expense of the association, showing photographs of various speakers who had undertaken to assist in the programme. These were widely published, always with some comment on the Maple Creek Convention and the work of the Western Canada Irrigation Association.

## FINANCIAL STATEMENT.

I have pleasure in submitting herewith the financial statement of the association for the period since the last audit, at the time of the Kamloops Convention, which shows the association to be in a favourable position financially.

*Receipts.*

On hand as per last audit.. . . . .	\$502 85
Refund from emergency cheque drawn for petty expenses at Kamloops.. . . . .	4 39
Alberta Government grant.. . . . .	500 00
Saskatchewan Government grant.. . . . .	500 00
British Columbia Government grant.. . . . .	500 00
Dominion Government grant.. . . . .	500 00
	<hr/>
	\$2,507 24

*Disbursements.*

G. A. Morrison, official report of Kamloops Convention.	\$176 25
Expenses paid speakers attending Kamloops Convention.	121 35
Cartage.. . . . .	0 78
Rubber stamp.. . . . .	0 30
Expenses of executive at executive meeting.. . . . .	117 35
Minute book.. . . . .	3 50
Grant to local Board of Control, Maple Creek.. . . . .	250 00
Official calls.. . . . .	49 70
Follow-up post cards, letterheads and envelopes.. . . . .	99 05
Art work for postcards.. . . . .	15 00
Art work for official call.. . . . .	9 00
Cuts for postcards and official call.. . . . .	28 10
Emergency cheque for expenses at Maple Creek.. . . . .	100 00
Acting secretary's salary.. . . . .	499 95
	<hr/>
	\$1,470 33

Total receipts.. . . . .	\$2,507 24
Total disbursements.. . . . .	1,470 33
	<hr/>
Balance on hand as per certificate of Bank of Commerce, dated July 28, 1917.. . . . .	\$1,036 91

## AUDITOR'S STATEMENT.

This is to certify that I have examined the books and vouchers of the Western Canada Irrigation Association for the period from July 27, 1916, to July 31, 1917, and I find the foregoing statement of receipts and expenditures to be correct, and the balance on hand to be \$1,036.91 (one thousand and thirty-six dollars and ninety-one cents) as per the certificate of the Bank of Commerce, copy of which is attached.

(Sgd.) GEO. A. MORRISON,

*Auditor.*

## RESOLUTION OF CONDOLENCE.

Upon receipt of the news of the death of Captain Bostock, son of the first vice president, a resolution was prepared and forwarded to Hon. Hewitt Bostock expressing the sympathy of this association with him and his family in their bereavement.

## INSTRUCTION IN AGRICULTURAL ENGINEERING.

In view of the need of a certain amount of engineering skill and knowledge in modern agriculture, a communication was prepared and sent, under the signature of the chairman of the executive, to Dr. Tory, Dean of the University of Alberta, laying stress upon the necessity of this particular branch of education.

On motion the secretary's report was adopted.

The CHAIRMAN: Now we have the appointment of two committees. I will read the names suggested. For the Credentials Committee: Messrs. Marnoch, Huckvale and Williamson. For the Resolutions Committee: Mr. F. H. Peters, Chairman, Prof. Fairfield, William Pearce, J. L. Brown and James Johnstone.

Carried.

Mr. MARNOCH: I think that before we close this morning we should express our appreciation to the president who has come here and addressed us. One of his valuable suggestions is for continuity in farming. Referring more to the Lethbridge district, I remarked to a friend that the crops appeared to be short in comparison with the years 1915 and 1916 and I made the remark that the feeling throughout the country when the crop is large is expressed in these terms, "the country is God's own country" and in another year "the country has gone all to h—". I would like to follow up Mr. Motherwell's suggestion with reference to continuity in farming and that is that we should all want to make it the best country.

Mr. Motherwell also made another valuable suggestion and that was as to the best use we should put our land to. He suggests a farm capable of being operated 50 per cent in irrigation and 50 per cent in dry farming methods. That raises a very broad question in this regard, that any extensive irrigation scheme requires very considerable expenditure. You have got to arrange that expenditure so that you can show returns for it. It is difficult to devise means whereby if you put down a considerable expenditure in irrigation ditches you can work the two methods. You desire to spread the water over as large an area as you can. Up to the present time our big irrigation schemes have been devised so that the land to be served with water



is that land which is most readily brought under water. If we are really going to make use of the water and make it fit in with Mr. Motherwell's suggestion so that every one can get some water for hay crops, the question will be just how we are going to fit the two things in. There is also another exceedingly valuable suggestion on the part of our President and that is with reference to having the Government operate an illustration plot under irrigated conditions in the irrigated districts. I would therefore express a motion of appreciation to our President. (Applause.)

CHAIRMAN: A gathering like this really warrants a man getting up and doing his best. What I have done this morning has been in an informal way and I am delighted to think it has met with your appreciation. I feel that this whole question of water supply is such that the question has arisen in my mind if the irrigation and dry farmers could not get nearer together in their conventions than they have done in the past. The reason that this has not been done is, I believe, due to the fact that there has been some little antagonism in the past. I would think that any one who endeavours to make the best use of the water that would ordinarily run off his land and utilize it for his crops is irrigating. (Applause.)

### AFTERNOON SESSION—WEDNESDAY, AUGUST 1.

CHAIRMAN: Professor J. Bracken, Field Husbandry Department, University of Saskatchewan, will address us on "Alfalfa."

Prof. BRACKEN: It has always been a pleasure to me to meet the dry farmers of the Maple Creek district. I cannot say that it is as great a pleasure to meet you "wet" farmers for the reason that I do not know your problems so well. Most of what I shall say to-day will apply only to dry farming conditions but some of our practices may probably apply to conditions under the ditch as well. I have had no experience, however, with alfalfa under irrigation.

I shall not take time to tell you how good alfalfa is. In this age we assume that every man interested in agriculture knows that it is the oldest forage plant and that it is the most valuable pound for pound of all forage crops. Wherever under dry conditions a ton and a half per acre can be produced it is the most valuable crop a man can grow, and wherever more than two tons can be grown under wet conditions no other crop can compare with it.

At Saskatoon during the past six years we have grown 125 strains of alfalfa secured from many different parts of the world. They are of three distinct types—(1) The yellow blossom. (2) the purple blossom, and (3) the so-called "variegated" alfalfa, which is supposed to result from a cross between yellow and purple.

The yellow is the hardiest, but has habits which may prevent it from being introduced in most systems of agriculture. It grows rather flat on the ground and the seed shatters badly when ripe.

The variegated has under our conditions proved the most useful. The hardiest varieties of this type are Grimm and Baltic. All the yellow ones lived through last winter, which was the hardest winter on alfalfa we have ever had.

One can grow the common sort and have it live through many winters, but occasionally it will fail and in doing so give a bad reputation to all varieties. Turkestan, the hardiest purple blossomed sort, killed out where it produced seed last year, but where it was grown for forage, some of it lived. Practically all the other alfalfas except the yellow, the Grimm and the Baltic killed out more or less.

I meant to have a dozen photographs of this crop with me this morning. They have not yet arrived, but I expect to have them to-morrow, when those who are interested can see them. This year we had twice as large a yield from alfalfa sown in June of last year as we did from that planted in July. In our tests alfalfa was

planted every ten days, starting with the 30th of April and ending the 30th of July. Alfalfa sown in June, our rainy month, gets better established. We think it should be sown in the rainy season. It cannot be sown earlier owing to the danger of spring frosts. It should not be sown later because it will yield less.

With regard to the amount to sow. Under irrigation and humid conditions you sow a larger quantity. We find it advisable to use less seed. When we sow thinly we obtain the best results. Five pounds of seed to the acre equals twenty-five seeds to every square foot of land. As little as three pounds per acre is sufficient for seed production when sown in 30 or 36-inch rows. Under irrigation conditions I realize you will sow more than that, but that point will be dealt with by those who will speak after me. When sowing broadcast we use ten to twelve pounds to the acre, but, of course, that depends upon the condition of the land. If the land is in perfect condition, less seed will be necessary; if in poor condition at least that amount is advisable.

Regarding inoculation I do not see very many practical farmers here this afternoon or I would go into this question more fully. Every student of forage crops knows inoculation for alfalfa is necessary. For two thousand years men have known that crops following a legume yield are better than when following a non-legume. But not until some forty years ago did they know why. Nitrogen is the most valuable fertilizing constituent in the soil. There are seventy million pounds of nitrogen in the air over every acre, or enough to grow 30 bushel crops of wheat every year for a million years; and we can use that nitrogen if we grow alfalfa and inoculate the soil. When alfalfa is inoculated with nitrogen-fixing bacteria, the bacteria draw upon the nitrogen in the air and make it available to the plant. Inoculation has given us an average yield of a thousand pounds more hay per acre. In some places men have gotten a bigger increase even than that. Our fields that were not inoculated killed out last winter, while those that were inoculated lived through. Under most conditions inoculation increases the yield and it makes the plants hardier and more able to withstand winter conditions.

No man operating on irrigated land thinks of growing alfalfa in wide rows, but some dry farmers are coming to think that if they are to grow alfalfa at profit they may have to grow it in wide rows. We have grown it for six years in 6, 12, 18, 24, 30 and 36-inch rows and the average yield is higher from the 30 and 36-inch rows than from any of the closer rows. The average difference between the 36 and 6-inch rows is a quarter of a ton to the acre. The cost of production in the wide rows was greater due to the intertillage necessary, but the added cost was met by the increased yield. While money is high and labour is high and equipment is high in price and while land is cheap, I question whether it is economical or wise to grow alfalfa in wide rows, but when conditions change it will in our opinion be wiser on dry land to grow it in wide rows than in close ones.

In the 36-inch rows sown at 3 pounds per acre we had a yield of 116 pounds of seed while in the 6-inch rows sown at 15 pounds to the acre the yield was 30 pounds of seed. From the point of view of seed production there seems to us only one method of procedure and that is to sow alfalfa in wide rows, at least 30 inches apart and cultivate them as necessary to control weeds.

In Saskatoon, where conditions are more severe than here, we had, in this our driest year, over a ton of hay per acre in the first cutting. Of course, it has been looked after—perhaps better than the average man can look after it. We recommend sowing alfalfa in rows only for dry lands or for seed production, but not for the irrigation farmer.

In regard to preparation of the soil, the worst enemy to alfalfa is the so-called blue-joint or quack grass. Alfalfa cannot compete with quack, although it may with other weeds. Neither can it compete with sweet grass. In irrigated areas, you have much of the so-called blue-joint. When this is present your soil preparation will have to be carefully done. We get best results from seeding on corn ground, next best



after potatoes and next on fallow, although good stands can be obtained at a much smaller cost on well worked down spring or fall ploughing. We try to sow it in the rainy season in order to get as quick a start as possible and so that the weeds will not get a chance to smother the slow starting alfalfa seedlings.

Just a word in regard to the first year treatment. As I mentioned before, last winter was the worst winter for alfalfa that we have ever had. Where we had any fall growth last year the alfalfa lived, but where it was cut late in the fall it all died. If we cut late in the fall, it lowers the production and endangers the life of the crop. We believe that alfalfa should be clipped back if there are weeds present, but if there are none we think it should be left uncut. The leaves of a plant are its stomach and if we cut off the leaves it cannot grow so well no matter how much we may hope it will "root" better. If alfalfa is to be clipped off it should be done early.

We have disced and renovated alfalfa land every season for the last five years and we find it keeps the field in a better condition, but decreases the yield except where the land bakes or where grass is present. Where discing improves the soil more than it hurts the plants, it is a good practice. A renovator is like a disc except that it has spiked teeth instead of the disced plates. It is an excellent implement for "renovating" grassy fields.

The important questions of cutting, curing and marketing alfalfa hay I shall leave to the other speakers who are more familiar with these phases of alfalfa culture than I am.

In conclusion let me emphasize the practices that will prevent winter killing:—

First, use hardy varieties; second, do not cut the crop too late in the fall, leave a little growth to hold the snow and protect the plant; third, inoculate the seed or the soil; fourth, if you are afraid of winter-killing do not grow for seed because seed growing is harder on the plant than hay production. One other point has impressed itself upon me since coming here and that is, do not irrigate too late in the fall.

I wish to refer to one other point before taking my seat and that is the lack of good seed. There is a demand for good, clean seed of the hardy varieties. I believe we can grow seed very profitably on our warm, dry lands in wide rows. Six points summarize our information on successful seed growing:—

First, use Grimm or Baltic. For sixty years Grimm has been developed by natural selection in Northern Minnesota and it has been grown here very successfully.

Second, sow in wide rows approximately 3 pounds to the acre or less.

Third, use warm soils. Heavy soil produces more forage under our conditions, but the warm soils produce more seed.

Fourth, inoculate and cultivate.

Fifth, use dry land. We have not had any irrigated land to grow our seed on, but from our observations we believe that dry land is likely to be better for seed production.

Sixth, do not cut the first crop for hay. In only one year out of five have we got mature seed at Saskatoon from the second crop, and even in that season the quality of the seed from the second crop was inferior and the yield only 82 pounds as compared with 116 pounds from the first crop. Our season at Saskatoon is not long enough to permit us to use the second crop for seed. (Applause.)

CHAIRMAN: Professor W. H. Fairfield, Dominion Experimental Station, Lethbridge, Alberta, will address us on alfalfa.

Prof. FAIRFIELD: Alfalfa is so peculiarly adapted to irrigation that it deserves and receives a great deal of attention in all irrigation projects in every part of this continent. There are a number of reasons why this is so, but to begin with, and as Prof. Bracken pointed out, it is an extremely rich and valuable plant, rich as a fodder and valuable as a soil renovator. Although it is a sub-tropical plant it has

great adaptability and when we bring it to the northern latitudes the amount of growth we get from it is governed entirely by the length of the season, assuming of course that it has an ample supply of moisture, and this we can supply with irrigation. As it is a semi-arid plant naturally it can stand a drought for one, two or three months or may be a year, and when the moisture comes it grows just as fast as if the drought had not occurred. That is one of the reasons why it is so peculiarly adapted to irrigation districts. We know in growing timothy that if moisture is not present in early May or June we do not get a crop. In alfalfa we just lose that period or any period where there is a shortage of water. When the moisture does come, the alfalfa comes on just the same as if it had not stopped growing.

We have reached the northern limit of alfalfa in the prairie of the Canadian Northwest. There is no question about this, although I am not assuming that it is not possible to bring it further north in some particular localities, such as perhaps to Peace River country and northern British Columbia. I firmly believe it has come to stay, although we are still as a matter of fact in an experimental stage in growing alfalfa in some districts in Alberta and Saskatchewan. A few years ago, you will remember, the corn belt was further south in the States than it is at present. Every decade has seen it brought nearer to the Canadian boundary so that now in certain localities in Western Canada it is possible to raise with profit some of the earlier sorts. They have accomplished this by finding suitable varieties and then adapting them to the shorter growing seasons. Just so are we going to bring the alfalfa belt north. As Prof. Bracken has pointed out, it will be brought about by the selection of hardy varieties. The importance of selecting these hardier varieties is illustrated by the winter-killing which has occurred in irrigation areas in Alberta during the last two seasons. If you will pardon me a moment in referring to local conditions at Lethbridge, I may say it has been growing for the last fifteen or sixteen years in the immediate vicinity of Lethbridge, around Raymond and Magrath, ever since water was brought down the A. R. and I. ditch. I know of one field sown in the spring of 1901 and that field is producing this year as good a crop of hay as any in the district, and has been producing crops continuously since 1901.

I am making my remarks apply particularly to the irrigated land. Until the winter of 1915-1916 I can honestly say that I have seen no winter-killing in the Lethbridge district that could not be attributed to some form of carelessness, such as to late irrigation or close pasturing or some such condition as we would expect to kill out alfalfa further south where there is no question as to its hardiness.

During the last two years there has been winter-killing and from reports there is some serious winter-killing in the Gleichen and Strathmore districts, but I believe Mr. Bark will be able to give us information as to this to-morrow morning. During the last two years in southern Alberta we have experienced more winter-killing in our trees and shrubs than we have ever noticed in the last ten or fifteen years. What would affect the growth of trees and shrubs will certainly affect the growth of alfalfa. I only speak of this in a desire to throw out a little hope, because the farmers in those districts that we speak of are becoming very much discouraged with alfalfa growing, but I am still confident that alfalfa can be grown there successfully, except on perhaps isolated farms or limited localities where conditions of soil are such as to make profitable growing of alfalfa somewhat doubtful.

The conditions that prevail in the Lethbridge district, that is the climatic conditions, are in my judgment about the same on east to Medicine Hat. Also on the main line of the Canadian Pacific railway east of Bassano and possibly Gleichen. West of that, however, the natural flora indicates that there is more rainfall and that the soil contains more humus than is the case in the drier areas. Those of us who are familiar with the climatic conditions in Alberta know that from a line drawn from Lethbridge to Gleichen it is much drier east of that line than west.

In alfalfa where we do meet with winter-killing the question of hardiness is of extreme importance. Prof. Bracken has touched on that and our experience is that



Grimm has given us the best results. I may say that we do not make much distinction between the Grimm and the Baltic. So far as I can learn the Baltic is merely a selection from the Grimm.

I want to add a word to what Prof. Bracken said in regard to the difficulty of obtaining hardy seed. Unfortunately there has been a great deal of seed sold under the name of Grimm that is not entitled to that name. Consequently when that seed goes to new districts or to beginners in alfalfa growing and they fail to make a success of it, they are inclined to damn the whole idea of alfalfa growing when they are not justified in so doing.

We have found that the best place to grow the alfalfa seed is on the dry land. It is common knowledge that alfalfa will not produce seed if heavily irrigated the season the plants are allowed to go to seed. It goes too much to leaf and stem and produces little seed. Consequently, the farmer on irrigated land will have to look to the dry-land farmer to produce most of his seed. We have grown it not only experimentally, but have gone into it on commercial lines to some extent in southern Alberta. The Canadian Wheat Lands Company, at Suffield, have about 3,000 acres in rows 3 feet apart. I had the privilege of going over this land last year, later in the season than this, and found only two or three hundred acres on which the plants had set seed properly. Whether it was on account of lack of insects to trip the blossoms or whether the climatic conditions during the season were not such as to favour the production of these insects or whether the season was too wet, we do not know. Last year, however, was unfavourable generally for the production of alfalfa seed. We must have dry, hot weather during the time the bloom is setting for seed. This year has been more favourable, but the excessive drought of the last three weeks has probably had some deteriorative effects on the filling of the seed as it has on other crops. To produce good alfalfa hay is very much more difficult than to make ordinary grass hay. With ordinary grass hay we can use labour-saving machinery to advantage gathering directly from the windrow to the stack. With alfalfa it is quite different. The food value of the alfalfa plant lies in the leaf. It is attached to the stalk with a slender stem. You can readily see that with careless handling a great many of the leaves will be lost and a great deal of the value of our feed will be gone.

Perhaps it is hardly the place to go into details as to this, but to overcome this we should watch very carefully and rake as soon as the hay is wilted sufficiently. After it has stood a short time in the windrow it should be put in small piles and cured, that is, do part of the curing in the cock. In this way if a rain does come before we can stack it instead of having to open up these piles and scatter them out and thereby lose some leaves and discolour most of it, we merely wait until the top of the pile is dry and roll it over and dry out the other part of the pile, and in a day or two we can start to stack again. In this way only part is discoloured, and the rest is left with the leaves and colour.

There has been one trouble or difficulty that the farmers in the Lethbridge district have met with in handling hay. The production of alfalfa hay is now becoming quite an industry as there are some 15,000 acres in alfalfa. In the beginning the farmers attempted to use the same kind of machinery as they used for hay with sweeps and an over-throw stacker. This was satisfactory providing the farmers cocked it up instead of stacking from windrow. However, these stacks were not made high enough and the hay settled rapidly and consequently with fall rains—and we are apt to have a great deal of rain in the fall—a lot of the alfalfa hay was hurt. After the season of 1914, when we had lots of hay, but had about a quarter or half destroyed by fall rains, the farmers started to put in stacking rigs either with a cable or with a mast and boom so as to be able to make their stacks 30 to 40 feet high, and this saved their hay, but in stacking it this way they made it 25 feet wide instead of 15 to 16 feet wide as before, consequently they did not have sufficient ventilation and the inside discoloured very badly, and although we had thousands of tons for feed in the Lethbridge district, yet it was hard to get "No. 1" hay in our district.

Some of our farmers were confident they would have a certain number of bales to sell but after going into the stacks they found the alfalfa had been changed to a white or musty colour, so this year the farmers are attempting to do more or less ventilating with these stacks. That is, where the stack is 30 feet high, they run through the centre a wooden horse about 2 feet high, and put posts across so that there is an air space of about  $2\frac{1}{2}$  feet high running lengthways in the bottom of the stack. In this way they hope to overcome the difficulty in heating. You must remember we are in a sub-humid climate, not in a semi-arid climate as in most places where it is grown in the United States and where they do not have to take the same care as we do in cutting and they do not have to take the same care as we do in getting the quality out of the stacks. There is just one redeeming feature in this that appeals to me. It is that, if the hay in the stack becomes somewhat damaged, due to excessive sap in the hay, the palatability or digestibility of the hay is not decreased. The digestibility is increased, if anything. Although it prevents a farmer from selling such a large proportion of his hay after baling, it does not hurt the hay for feed, consequently it will have a tendency to make farmers in irrigated areas go more quickly into live stock than they would otherwise do.

I have made a few notes in regard to some points that we consider important in regard to seeding alfalfa, but Prof. Bracken covered that pretty well. I will only say a word or two supplementing or modifying one or two of his statements. I am speaking of sowing alfalfa on irrigated land and he was speaking of sowing alfalfa on dry land. We find that, although corn and potato land is ideal to sow alfalfa on, the man on irrigated land hesitates to do that. He would rather put a crop of grain in on such well-prepared land as it is all ready for the seed drill, and put a crop of alfalfa on it the next year. We find that if we have the moisture and the seed bed is well prepared, we can get the same results by sowing on stubble. We are assuming, of course, that a man is able to irrigate before the plants are suffering acutely. We assume that we will get enough rain to bring it up. We sow in late May or early June and irrigate the first season usually in July. We have found that, where we plough stubble it is apt to be a little too loose and open. Where we have stubble land free from grass the "stubbling in" method is satisfactory, and I may say that in drier portions of Alberta we are not apt to be bothered so much with the grass as we are in the portions where the rainfall is greater. Do not misunderstand me. I am assuming that the land has been properly ploughed the year previous, at least 6 inches deep, and is in good tilth, and on that land we can get better results by double discing than we could by ploughing, if it is free from grass. We found that where it is necessary to plough it should not be too deep, providing always that the lands have been ploughed to a good depth previously.

We find that the first winter after the alfalfa is sown it is more sensitive to winter pasturing than later on and under no conditions is it wise to pasture too closely with sheep. I think there are more fields of alfalfa spoiling in the Lethbridge district by the indiscriminate winter feeding of sheep than almost any other cause as they are apt to be on the ground when it is very wet and they dig up or disturb the ground to 2 or 3 inches down from the top and so injure the crown on the plant.

The longer we work with alfalfa and the longer we irrigate it, the more we hesitate about giving any dogmatic rules in regard to when and how it should be irrigated. Under some conditions fall irrigation is most desirable. Under other conditions and on certain soils it is not so desirable a method to follow. On certain soils we soon learn that it is not wise to irrigate late in the fall. Some seasons the land irrigated in the fall yields 50 per cent more the following season than that left unirrigated. On the other hand, if we happen to have an excessive amount of rainfall in the spring, fall irrigated stuff does not do so well and there is always the possibility of causing winter injury in certain locations. It is, therefore, most difficult to formulate dogmatic rules. It reminds me of the point our president made this morning. He made the statement that farming under irrigation tends to intensive

self farming. That is true and as irrigated farming tends to more close attention to details generally, so it is with the growing of this forage crop so peculiarly adapted to irrigation, each farmer must work out his own details of management best suited to his particular farm.

There is just one rule that can be laid down and one can be quite safe in making it and that is whenever the land is dry and the alfalfa needs irrigation, it is pretty safe to give it. This will not only apply to summer irrigation, but also to fall irrigation, and one can safely irrigate in September. In October and November irrigation we are apt to encounter danger owing to the formation of ice on the surface.

It is not necessary in a meeting of this kind to point out that before alfalfa can be grown successfully we must determine that the field to be used has natural surface drainage. We must not have land where irrigation water will stand 24 or 48 hours after irrigating. It is practically impossible under those conditions to handle it right. This applies generally to the irrigation of all crops.

Prof. Bracken mentioned the advisability of sowing in June rather than July. The reason for that is that a better stand is obtained when sown during the rainy period. We find that seeding with a nurse crop does not give the most satisfactory results—the grain thins the stand down and although the fields look very nice to the casual observer, and look perhaps just as promising as the field next to it sown with a nurse crop, still the yield is not so great. We are seeding alfalfa down to last for a number of years and we must therefore seed, on irrigated land as on dry land, without a nurse if we wish to obtain maximum yields.

CHAIRMAN: You mean a robber crop?

Prof. FAIRFIELD: The president says he thinks I mean a robber crop, and I think he is right.

Prof. Bracken also said that five pounds of seed on well-prepared land gave the best results at Saskatoon. I may say that we have carried on a number of experiments at our Station and have observed the fields of a number of farmers in the district, and we have come to the conclusion that with land prepared in the ordinary way, it is not safe to sow much less than 12 or 15 pounds. Personally I like to sow up to 15 pounds on irrigated lands.

Perhaps what I have said and particularly what Prof. Bracken has said may provoke a discussion and in that discussion some interesting points may be brought up and discussed. (Applause.)

CHAIRMAN: If we have the farmer here who has been growing any of these samples I see here, it would be in order for him to say something. I understand Prof. Fairfield to say that in irrigating alfalfa you cannot flood it the same as the prairie land—you cannot leave it for 24 hours?

Prof. FAIRFIELD: Our system is flood irrigation. What I referred to was surface drainage. When the irrigation of a particular field is completed what water does not soak in must be made to drain off, otherwise it forms a slough, and if it remains on for a day or two in such a manner it turns the alfalfa yellow and injures it.

CHAIRMAN: In growing alfalfa on dry land, I was wondering whether Prof. Fairfield had any experience with sub-soiling for the retention of the moisture—that is before seeding down.

Prof. FAIRFIELD: We have carried on no experiments, but I can give my opinion. It would depend a great deal on the character of the subsoil. On seeding alfalfa on dry land I think it is exceedingly important to have it well summer-fallowed. If the land has been well summer-fallowed during a season and we have had a normal amount of rainfall the subsoil will be moist down to perhaps six or seven feet. My observation is that where moisture is present the alfalfa roots will go down through



practically any soil that I have had experience with, providing the moisture is there to lead it down. I do believe that it is very important to have the land ploughed at least six to eight inches deep. I question whether it would give enough increased yield on subsoiled land to pay for the additional cost.

Mr. JOHNSTONE: I have had no trouble in growing alfalfa but I have trouble in making hay. I have never bought any alfalfa that contained more than 25 per cent of the leaves. As a rule, when you buy alfalfa hay from here or any other place you find a bundle of sticks and it makes me believe that there are few that do know how to make proper hay. I think something should be done to make a demonstration of baling alfalfa hay.

DELEGATE: The feeding value of alfalfa is in the leaves. I have noticed the mangers in a barn about three-quarters full of alfalfa leaves, and it looked as if the horses would not eat the leaves and I spoke about it, and the owner said that it was a fact that the cattle would eat the leaves and leave the stalks and the horses would eat the stalks and leave the leaves. I have read in agricultural books also about turning cattle into alfalfa fields when the dew is on the grass, which would cause bloating in the cattle. If cattle eat part only of the alfalfa plant and the horses eat a part only and the cattle are liable to get bloated if they eat it when it is wet, we should, I think, hear more about rye or brome as it is the best pasture in the world.

CHAIRMAN: I do not think that any one wants to discriminate between the grasses and the clovers, but the theme at present is alfalfa. As to the fine part of the hay, I have found that all the finer parts of any hay will go to the bottom of the manger. I have been growing brome grass for over twenty years and I let it go to seed, and I use the hay for the horses and it makes particularly good horse hay, but there is a certain amount of chaff and you have to clean that out of the mangers, but the sheep and the cattle will eat that quite readily.

Mr. HUCKVALE: Mr. Fairfield was speaking about a certain amount of alfalfa killing out in the last winter or two and I think all those that are growing alfalfa have had the same experience in many years. I would like Prof. Fairfield to tell us what method he has for renovating those fields where alfalfa is killed out.

Prof. FAIRFIELD: I have never had success in reseeding an old alfalfa field. Where it thins down to the point where it is unprofitable to produce hay, we have found it better to plough it up and seed to grain and take off a crop or two and then reseed. Some years we have seeded and got a poor crop and then seeded it again next year. It is usually the old fields that kill down. Where we would ordinarily think that the plants had become well established, that is after a field is three or four years old, it is more apt to winter kill than when one or two years old. We have not had success in reseeding. We cannot get enough of the young plants going to thicken the stand up. I know of some instances where a field has gone to seed and the following year the seed that was shattered would come up and with careful irrigating and cutting the first crop early so as to let the sun on the young plants they have come through all right. But, under ordinary circumstances, it is well to plough up, and of course a person has a marvellous crop of grain or anything else they wish to grow following that.

Mr. W. PEARCE: I would like to ask Prof. Fairfield and Prof. Bracken if they have had any experience in siloing alfalfa?

Prof. BRACKEN: We have done a limited amount of alfalfa in the silo. We bumped up against what some one else has spoken of and that is curing alfalfa, and we have now demonstrated that alfalfa can be ensilaged satisfactorily, but it is rather liable to be laxative for animals. We do not recommend putting it in the silo alone from our experience, but it can be done, I think, with satisfactory results.

Mr. PEARCE: Three years ago I had the privilege of meeting the delegates from Kansas who attended the International Congress in Calgary, and they told me in regard to alfalfa growing under sub-irrigation that most of it was put in the silo, and they found that by putting the same quantity of straw as alfalfa through the cutter—that is the same quantity in bulk, not weight—the result was very much better than straight alfalfa. The straw in other words carried the properties that the alfalfa was weak in and they never thought of handling alfalfa in any other way. It was chiefly used in the production of beef and they used a certain amount of corn in the feeding, but the whole output of alfalfa was turned into meats. If you could get it into a silo, that would do away with the trouble of handling it. You could have the whole product in that way available. You would not have the horses picking out some and the cattle picking out the balance, and I do not know a better way of using our straw stacks than mixing it up.

Prof. LINFIELD: There are only one or two points that I might comment on. One is the fear of alfalfa killing out. Down with us we have got in the habit of rotating crops. As a matter of fact in the Gallatin Valley over there our crop rotation is two years in clover and two years in grain. If we grow three crops of grain on irrigation land it just cuts the grain crop in half. My advice to farmers down there is to plough up the alfalfa after four or five or six years and seed to grain. Of course, if you keep on growing it, it will grow. Go farther south and you will find it growing for many years in the one field. If you cultivate alfalfa in the fall or plough it in the fall it will kill it. It is hard to kill it by ploughing. It takes a lot of power. If our alfalfa does not kill out once in fifteen years I would rather have it killed out in half of that time. You have to have a soil crop intervening. If you are going to grow grain at all you should grow soil-enriching crops. The conditions in northern Montana are not so very much different to what you have here. I always figure where I am climatically, and when I climb 1,000 feet in the air I figure I am going 500 miles north and in the Gallatin Valley we really have a shorter season than you have here. In other words, you can grow things a hundred miles east of here that you cannot west of here. Your winter wheat is probably a case in point.

Speaking of climatic conditions, other things being equal, we have found it so and we get just as good returns by seeding to a grain crop. Our land is sometimes worth \$200 to \$300 an acre. We seed our alfalfa field to a grain crop and we have tried it out and afterwards we found we got just as much out of it. When land becomes high priced, as it is in the older settled districts, we cannot afford to have the land idle. That does not apply, of course, to dry land. I am speaking of irrigated land.

There is one other point that I would like to supplement and that is in the matter of alfalfa in the silo. It does not pay to silo it if you grow it as hay. I came to that conclusion a long time ago that it does not pay to ensilo any crops if you can cure it for hay. We have put alfalfa in the silo because it has been too wet at times to cure it. The stock has done very well feeding on it from the silo. If you can cure it for hay do so. With well cured hay or silo alfalfa there does not appear to be any difference for feed as the milk flow in dairy cattle seems to be kept up the same with either.

The CHAIRMAN: I will now call upon Mr. F. H. Peters, Commissioner of Irrigation, Department of the Interior. Calgary, for his address.

### RESERVOIRS IN THE CYPRESS HILLS DISTRICT.

Mr. PETERS: I had the pleasure of giving an address on this same subject before the annual meeting of the Cypress Hills Water Users Association, I think two years ago. I am giving an address on the same subject again because I believe it is the most important question to be faced by the private irrigators in the future. Whenever

one studies the stream run-off of any of these streams in this district one fact stands out clearly, namely, that in nearly every year about 75 per cent the total annual flow runs off in March and April, which is long before the time the water is most needed on the fields, or will do most good if applied. When consider this and also note that periodically there are dry years with insufficient water even if it were spread evenly over the season, and that periodically there are years with floods in the spring that do very great damage, we see immediately that there is only one cure for all these troubles, and that is reservoirs. The Cypress Hills water users are having the same experience as all other irrigation developments on streams on the prairie not fed by mountain snows. In fact it may be said of these streams that the greatest question concerning water supply is always reservoiring.

Water in a reservoir is like money in your pocket—you have it to spend when you want it; without a reservoir, water is like money some one has promised to pay you—you do not know when you will get it. The question here is fortunately not so much one of lack of quantity—there is enough water—it is just a question of storing it, so that it is available during the dry, summer months when your fields need it. I want to make the point that at present most of the farmers will actually use water apply it on hay lands and one good soaking in the spring does a lot of good, but when the holdings are smaller, or when competition in future makes it necessary to work the land to its full capacity, you will want to have water for other crops in the later dry months. Further, reservoirs will store water and make it available for more land and thus benefit the whole district.

Before I start on facts and figures, you must realize that the building of reservoirs will be a big work, it will cost much money, but it is no bigger job now or in a few years than the building of the ditches was in the old days, when you were not so well established. Because it is a big job we must tackle it early so as to make haste slowly but surely. We must study the question from all angles, collect all data possible, get cost figures, etc., so that when the right time comes everything will be properly lined up.

You must also realize that this is a very complicated engineering question, to decide just how big the reservoirs should be, just how much water we can rely on saving, and so on. I do not present this paper as the final word in the matter, but rather have tried to put the matter before you in a general, but true light, anticipating that as time goes on our records will be more complete, and that when active agitation for the building of any reservoir takes place, it will be the proper time to make the final study of each case.

One other point—we have been getting suggestions from farmers as to possible sites so that we can study them as we are able. The Irrigation Branch still wants these suggestions if any one knows any more possible sites.

#### *Reservoir No. 1—*

Name.—Cypress Lake.

Township and range.—Township 6, range 26 and 27, west of 3rd meridian.

Total cost.—\$481,570.10.

Capacity of reservoir.—126,625 acre-feet.

Cost per acre-foot.—\$3.80.

Impounding dam on east side, located east half section 24, township 6, range 26 west 3rd meridian.

Impounding dam on west side, located section 15, township 6, range 27, west 3rd meridian.

Cypress Lake reservoir was completely surveyed in 1913 and all the necessary data for estimating capacity and cost is available. In the report of the Irrigation Branch published in 1914 the capacity and cost were figured for a dam 22 feet high at the east end. The figures taken out on this basis are as given in the foregoing schedule. The cost per acre-foot stored is very reasonable, \$3.80, but when we reckon



on the cost per acre of land which can be irrigated and which land must pay for the reservoir, it runs into the higher figure of \$16 per acre based on irrigating 31,000 acres.

At the present time we are able to estimate on the matter of water supply a little more closely because we now have more records available and the more recent survey of the Fifty Mile reservoir also affects the question.

In the irrigation report referred to above it was assumed in considering water supply that two or three wet years like 1912 might follow each other and that water would be stored for successive dry years like 1910 and 1914. This method of study led to the adoption of a reservoir capacity of 126,000 acre-feet, which is no doubt amply large and would give complete storage for all water available under any conditions which might arise. Making a more recent study of supply and demand based on stream flow records for 1911 to 1916, it is found that under these conditions a reservoir with a capacity of about 90,000 acre-feet would be large enough based on storing all the water available, absorption losses of 3 feet in the reservoir, and a gross duty at the reservoir of 1.5 acre-feet.

This study showed that the water supply available was sufficient to irrigate 21,531 acres only. The cost of the reservoir would, however, be reduced to about \$340,000, making the cost per acre-foot stored about \$3.77 and the cost per irrigable acre the same as before, about \$16. This is just the same cost per irrigable acre as that originally figured, so that we may consider this price not far wrong.

The water in Cypress Lake reservoir under the latest study would be utilized to irrigate lands as follows: 5,231 acres on Battle creek below the reservoir for which rights are now granted or pending, and 2,000 acres of new land which it has been estimated lie below the reservoir and can be irrigated. On the Frenchman river 5,422 acres below the reservoir for which rights are now granted or pending, and 8,878 acres of new land which it has been estimated lie below the reservoir and can be irrigated. This makes up the total of 21,531 acres.

In connection with this reservoir, the only engineering point about which there is any question arises in connection with diverting the early spring run-off into the reservoir through the made canals. Those of you who were interested enough to read the report published in connection with the survey made will remember that it is planned to divert Battle creek, Belanger creek and Davis creek into the reservoir through made diversion canals. This spring run-off which produces practically all the water for storage takes place in March and April, and there may be very considerable difficulty in operating the diversion canals at this season of the year due to snow and ice conditions. Another point which should be noted is that in each year there is a certain quantity of water flowing into the streams below the reservoir which cannot be controlled. We have estimated that whatever quantity is available from this source will be used as it comes, in satisfying the water rights on all the irrigable land below the reservoir, up to the limit of getting 50 per cent of the required water in this way. In four out of the six years studied the irrigators would have had to take less than 20 per cent of their supply as it became uncontrolled, mostly in the early spring, and in two of the years they would have had to take 50 per cent, the remainder being figured as wasted. This feature is not very desirable, but was adopted so as to store and save as much water as possible for the driest years when it is most needed.

#### *Reservoir No. 10—*

Name.—Fifty Mile Reservoir.

Township and range.—Township 5, range 16, west 3rd meridian.

Total cost.—\$355,800.

Capacity of reservoir.—Approximately 52,000 acre-feet.

Cost per acre-foot.—\$6.84.

Impounding dam located.—NW.  $\frac{1}{4}$  section 24 and NE.  $\frac{1}{4}$  section 23, township 5, range 16, west 3rd meridian.

Height of dam.—55 feet.

To complete the storage problem for the Frenchman river we will take up the Fifty Mile reservoir. Surveys have been made of this site by the Irrigation Branch so that details as to capacity, cost and water supply are available. Studying the reservoir in the same manner as Cypress lake we have adopted a dam height at 55 feet, giving a reservoir capacity of 52,000 acre-feet. This works out at \$6.84 per acre-foot stored and nearly \$21 per acre of irrigable land to be served. This is based on serving an irrigable area of 17,000 acres. It has been estimated that there are 24,000 new acres which can be irrigated on the Frenchman all below this reservoir. The 8,000 odd new acres estimated to be served from Cypress lake also lie below the Fifty Mile reservoir, so together our study provides water for a little more than the estimated acreage. The water for the 8,000 odd acres is to be held in the Cypress Lake reservoir, because it is cheaper to provide the storage there than in the Fifty Mile.

To sum up then for Battle creek and Frenchman river, we are dealing with a total irrigable area of 45,708 acres. On Battle creek, water can be stored for 5,231 acres now developed and 2,000 new acres for \$16 per acre. There are still 3,475 acres above the reservoir and 185 acres on tributaries below, which cannot benefit directly by the reservoir. On Frenchman river there are 5,422 acres now developed and 8,811 new acres for which water can be stored at \$16. There are an additional 15,117 new acres which can be served by reservoir water at \$21 per acre. There are still 2,494 acres above the reservoirs and 2,901 acres on tributaries below, which cannot be directly benefited. That is 80 per cent of the irrigable land can be provided with reservoir water and 20 per cent cannot be so provided. While the irrigable acres above the reservoirs and on the tributaries could not benefit directly by the reservoirs they probably could do so indirectly by paying a certain percentage of the cost of the reservoir and thus buying all the low water flow which could be used by them in lieu of flood waters stored and which could be equally well used by the irrigators below the reservoirs.

#### *Reservoir No. 2—*

Name.—Middle Creek.

Township and range.—Township 5, range 30, west 3rd meridian, and range 1 west 4th meridian.

Total cost.—\$66,458.

Capacity of reservoir.—21,826 acre-feet.

Cost per acre-foot.—\$3.04.

Impounding dam located.—NE.  $\frac{1}{4}$  section 21, township 5, range 30, west 3rd meridian.

This reservoir was also completely surveyed in 1913 and all the necessary data for estimating the capacity and cost is available. While it is feasible to divert water from Middle creek into Battle creek and thence into Cypress Lake reservoir there would be no object in this since the reservoir site on Middle creek is large enough to store all the water available and control it for use below on the same creek.

The most recent study of supply and demand conditions for this reservoir based on the actual stream records for 1911 to 1916 adopts a reservoir capacity of 15,000 acre-feet as the most desirable and which is sufficient to control the total supply available which occurred during these years.

The cost of this reservoir is estimated at \$66,458, making the cost per acre-foot stored, \$4.43. The total area which could be served is 3,130 acres, which comprises 1,530 acres now developed and 1,600 new acres out of the area which it has been estimated can be irrigated and lie below the reservoir. Based on 3,130 irrigable acres the cost of this development is \$21.23 per acre. Considering the whole of Middle creek, there is an additional irrigable area of 1,271 acres lying above the reservoir and 97 acres on tributaries below, which cannot be served from the reservoir. In addition to this 792 acres of irrigable land will be flooded out by the reservoir.

It is to be noted again that in the study made as above, all the additional uncontrolled flow in the creek below the reservoir is assumed to be utilized, as it occurs naturally and mostly in the early spring. The percentage of the total supply which would have had to be used in this way in the study made would average 68 per cent. There are no difficult engineering features in connection with this reservoir, but viewed from an economic standpoint there are two bad features in the high absorption losses from such a shallow reservoir and the fact that so much irrigable land has to be flooded, its productive value is therefore permanently ruined.

We estimate absorption losses of at least 3 acre-feet per acre of water surface in the reservoir. The duty on the land is estimated at 1.5 acre-feet, so that for every acre of water surface in the reservoir we lose enough water to irrigate 2 acres of land below. The water surface in this reservoir would be about 1,000 acres, so that in order to save water enough to irrigate the 3,000 odd acres below we are forced into losing water enough to irrigate 2,000 acres. There is no way of overcoming this loss if we try to store water over from year to year, which it is necessary to do in order to provide the maximum conservation of water.

Then again in order to benefit 3,130 irrigable acres below we have to destroy 792 irrigable acres in the reservoir site. That is to say that for every 4 acres benefited we have to destroy 1 acre. If we adopt the viewpoint that we have plenty of land out here in the West, there seems to be no objection to this, but when we consider that the whole proposition is one for the reclamation of, and added productivity to, certain lands for the benefit of not only the few people owning the lands improved, but for the benefit of the whole community, it is difficult to justify the destruction of such a high ratio of equally good land in the reservoir.

#### *Reservoir No. 4—*

Name.—Maple Creek.

Township and range.—Township 10, range 26, west 3rd meridian.

Total cost.—\$24,667.

Capacity of reservoir.—1,954 acre-feet.

Cost per acre-foot.—\$12.62.

Impounding dam located.—SW.  $\frac{1}{4}$  section 17 and SE.  $\frac{1}{4}$  section 18, township 10, range 26, west 3rd meridian.

#### *Reservoir No. 5—*

Name.—Parsons Lake, Maple Creek.

Township and range.—Township 10, ranges 25 and 26, west 3rd meridian.

Total cost.—\$7,000.

Capacity of reservoir.—418 acre-feet.

Cost per acre-foot.—\$16.70.

Impounding dam located.—SE.  $\frac{1}{4}$  section 13, township 10, range 26, west 3rd meridian.

#### *Reservoir No. 8—*

Name.—Downie Lake Reservoir, Gap Creek.

Township and range.—Township 10, range 28, west 3rd meridian.

Total cost.—\$6,600.

Capacity of reservoir.—4,200 acre-feet.

Cost per acre-foot.—\$1.60.

#### *Reservoir No. 9—*

Name.—At junction of Gap and Maple Creeks.

Township and range.—Township 11, range 26.

Total cost.—\$35,000.

Capacity of reservoir.—Approximately 3,200 acre-feet.

Cost per acre-foot.—\$11.



We will now consider Maple Creek watershed on which we have investigated four reservoir sites noted above. The first two reservoirs have small capacities of 1,954 acre-feet and 418 acre-feet. Their cost of development would be rather high, \$12.62 and \$16.70, respectively, per acre-foot stored, so that probably they will not be developed until after the latter two which appear to be more favourable sites.

Downie Lake reservoir is the cheapest of any that we have investigated in the Cypress hills, having an available capacity of 4,200 acre-feet, at an estimated cost of \$1.50 per acre-foot stored.

We have no direct stream records of the supply available for this reservoir, but our estimations, based on records for 1911 to 1916 indicate that the reservoir could be fully filled in three years and only about half filled the other three, so that there probably is not the water available to store over from one year to another.

Maple Creek reservoir No. 9 was surveyed recently and the cost taken out for a reservoir capacity of 3,200 acre-feet. This capacity would not be nearly great enough to store all the water that is available from Maple and Gap creeks, and a further tentative study has been made, based on raising the dam 5 feet, which would increase the capacity to about 6,230 acre-feet and the cost to about \$57,640, or \$9.25 per acre-foot stored. In either case the reservoir is not big enough to store all the water available and it would not be large enough to store water over from year to year.

Considering Downie reservoir and No. 9 together, there are 5,086 irrigable acres now developed below them. On the basis of using these reservoirs to store the spring freshets for use later on the same year only, and figuring absorption losses for two or three months, each year we might by using the larger capacity for No. 9 have available there about 5,400 acre-feet and in Downie about 2,000 acre-feet. This total of 7,400 would store enough to provide practically a full duty of 1.5 acre-feet for the irrigable land between and assessing the total cost of \$64,240 against 5,158 acres would amount to \$12.45 per acre.

Discussing the watershed again in a general way, we have four reservoirs, with a maximum capacity of 12,802 acre-feet, assuming that the three upper ones could always be filled. The stream records of the total flow occurring above the lowest reservoir for 1911-1916 show an average water supply of 20,266 acre-feet varying from 8,660 acre-feet to 34,745 acre-feet in dry and wet years. Lying below the four reservoirs there are 5,378 acres of irrigable land and above them 1,178 acres.

The development of the reservoirs as indicated above would give an assured and fully controlled supply to all the irrigable land now developed. It would also allow of new irrigable land utilizing the surplus spring flow during the wet years, say four out of every six, but the new irrigable land would have no assurance of supply during the other two years if we accept the run-off for 1911-1916 as typical.

#### *Reservoir No. 3—*

Name.—Skull Creek.

Township and range.—Township 11, range 22, west 3rd meridian.

Total cost.—\$28,390.

Capacity of reservoir.—3,873 acre-feet.

Cost per acre-foot.—\$7.35.

Impounding dam located.—SE.  $\frac{1}{4}$  section 9, township 11, range 22, west 3rd meridian.

The stream records on Skull creek for 1909-1916 show an average run-off available of about 2,800 acre-feet, varying from 800 to 7,000 acre-feet in dry and wet years. The maximum capacity of the reservoir is 3,873 acre-feet and the annual requirements based on a duty of 1.5 acre-feet amount to 1,854 acre-feet, so that without having made any detail study it appears that this reservoir is not large enough to carry over from year to year and always provide nearly a full supply, because of the loss by absorption. There are 1,236 irrigable acres on Skull creek of which 1,070 acres lie

ed flow the reservoir. If the maximum capacity was developed at a cost of \$28,390  
ies d assessed against the acreage below it would amount to \$26.50 per acre.  
r his It would seem that in this case the best scheme would be to develop the reservoir  
y with a capacity sufficient to store the spring floods and use the water later on in the  
site year only. A rough study indicates that for this purpose a capacity of 2,600  
in the feet would be sufficient, reducing the cost to about \$24,000, which assessed against  
ost e acreage below, would amount to \$22.43 per acre.

#### Reservoir No. 6—

Name.—Hay Creek.  
Township and range.—Township 10, range 25, west 3rd meridian.  
Total cost.—\$2,544.50.  
Capacity of reservoir.—294 acre-feet.  
Cost per acre-foot.—\$8.64.  
Impounding dam located.—NE.  $\frac{1}{4}$  section 8, township 10, range 25, west 3rd  
meridian.

#### Reservoir No. 7.

Name.—Hammonds Lake, Hay Creek.  
Township and range.—Township 10, range 25, west 3rd meridian.  
Total cost.—\$4,035.  
Capacity of reservoir.—333 acre-feet.  
Cost per acre.—\$12.12.  
Impounding dam located.—SE.  $\frac{1}{4}$  section 9, township 10, range 25, west 3rd  
meridian.

On Hay creek there has been some investigation made of reservoirs Nos. 6 and 7.  
he first has a maximum capacity of 294 acres, which can be developed at a cost of  
3.64 per acre-foot stored. The second has a maximum capacity of 333 acre-feet, at  
12.12 per acre-foot stored. The total irrigable area developed below these two reser-  
voirs is 1,330 acres, so that at best they could only store a part supply and the cost  
ould be high.

If I have suggested at any place in my paper that the cost will run rather high  
r that the reservoir sites are not particularly good ones, I want no one to construe  
and his in the light that I am trying to pour cold water on any of the developments. I  
ave simply studied each case in the light of the best information available and,  
sing my best judgment, have tried to place the facts before you in their true light.

In conclusion, gentlemen, I can only say what I did in the commencement, that  
his question of reservoir development is a most important one and deserves the most  
ull and continued attention until the ways and means are found to develop every  
ossible reservoir to its fullest capacity of usefulness. (Applause.)

CHAIRMAN: I presume this is really a reclamation scheme outlined and to be  
sed at such time as the farmers desire to have allocations made to them. The cost  
f \$16 per acre seems to be high, but when you count the difference between a crop  
f 1915 and a crop of this year, the cost will go a long way to pay for the difference.  
rdt is really not much greater than clearing heavy scrub land. So it is not so much  
ut of the way as it seems, but the question is how soon will the settlement require  
his class of land. There is no doubt in my mind that when we come to have the  
leopulation and development we will have such conditions as will warrant it. The  
s. next on our programme is an address from Prof. E. E. Prince, Dominion Commis-  
sioner of Fisheries. In his absence, Mr. S. G. Porter, of the Department of the  
g interior, will read the paper.

## INSTALLING FISH IN RESERVOIRS.

By PROFESSOR EDWARD E. PRINCE, DOMINION COMMISSIONER OF FISHERIES, OTTAWA

It has been asserted again and again that it is impossible to carry on any fish culture with irrigation and maintain a supply of fish in the same areas. It is because I have heard the opposite opinion that I venture to present a paper on the subject to-day. While I believe that a supply of useful fish, useful for the table and for sport, tailwheels can be maintained and indeed made a part of a system of land irrigation, it is essential in my view that effective means should be taken to prevent the destruction of fish inhabiting irrigation canals. The Venerable Doctor John A. Henshall, the well-known Montana fishery expert, wrote in 1903: "It is disheartening and discouraging to the western fish culturist to know that millions of fish, both large and small, annually perish through being stranded on meadows and grain fields as a result of local unscreened ditches." He sees a large percentage of the work of the United States Fish Commission go for naught from this cause. There is, of course, much diversity of opinion as to the importance of fish as compared with the interests of agriculture, and many agree with the naval authority who stated to the Dominion Fishery Commission in 1910, "that you can't have irrigation and fish." Now the screening of irrigation ditches in general is not difficult, though it must always involve some trouble and expense, or the fish, especially the schools of young fish, will pass out over the "laterals"; but there are cases, particularly the large reservoirs and canals, when the difficulty is great. Thus it must be admitted that the maintenance of screens on canals of such large capacity as the Bow River reservoir, supplied from the Bow river, presents a serious difficulty. The gates are four feet wide with a five foot head of water from the river, and over 1,500 miles of ditches can be supplied under this Canadian Pacific irrigation scheme. The Dominion Fishery Commission in 1910, already referred to, after looking into this matter, admitted that there was a difficulty owing to the water being more or less charged at certain times with floating matter such as leaves, weeds, etc., but, added the commissioners, the difficulty can be overcome in most cases by erecting screens, not at the intake, where there is a great force of water, but lower down in the canal at a point below the first water gate. If screens placed in such a position show a tendency to become blocked with debris, it would be necessary to have men visit them and keep them clear, in the opinion of the commissioners.

It seems to me that this subject of fish and irrigation divides itself into two sections. In the first place we have irrigation systems in the hilly country among the foothills, the supply of water being obtained from swift mountain streams. The character of the water and kinds of fish differ most markedly from those of the lowland country and the plains, where the water is more sluggish, and the conditions are adapted for fish of wholly different kinds. The foothill streams are inhabited with the best kind of fish, fish not only esteemed by the sportsman but regarded also as superior table fish. These superior kinds are the gamy red-throat or cut-throat trout, the esteemed grayling, that is, the true grayling with the high dorsal fin, and the Rocky mountain whitefish, also known as Williamson's whitefish, which is commonly called grayling in the Calgary district. Now I do not hesitate to say that screens should be provided at the intake of these smaller irrigation canals to prevent the entrance of these justly esteemed kinds of fish. The difficulty is not great, as the water is very free from floating debris, and little labour would be required to clear away any small accumulation of weeds or leaves. It is very difficult in the case of the very large canals or reservoirs, these being of great capacity, usually of considerable width and depth, and the body of water very large at the intake, so that the matter from a fisheries point of view is wholly unlike that which the smaller irrigation systems present. Such reservoirs of great capacity in which a large body of water moves slowly could, in my opinion, be turned to excellent account for fish culture. It is true that the Alberta Commission, on page 13 of part 2 of their report before referred to, stated that certain inferior kinds of fish might be positive



increased in numbers, after the erection of dams and the retention of bodies of water to supply irrigation canals. In speaking of the Southern Alberta irrigation scheme they said, respecting the ten foot dam southwest of Namaka, "If fish, mostly pike (or black-fish) or suckers found their way into the reservoir, below the head gates, a larger number of these fish would thrive there than occur in the Bow river and fish food for the people would be increased," and they pointed out also that the Canadian Pacific railway reservoir near Bassano, three miles below the headgates would be a benefit rather than a detriment to fish, if proper precautions were adopted.

The erection of dams, and the blocking of even important streams is not always a detriment, for the retention of a large body of water may provide more food, cooler conditions, and more ample environment for fish, and result in larger fish and a more abundant supply. Local conditions vary, and a condition that may be injurious in one locality may be actually beneficial in another. I can recall two cases of substantial benefit to the fisheries, due to the erection of dams which caused great complaint and local criticism on the part of mistaken enthusiasts. Thus, in a trout stream in Guysborough County, Nova Scotia, small trout abounded, though at certain seasons some large sea trout ascended and later descended and returned to the sea; but after the erection of a dam for logging purposes, the body of water above was increased, and the trout retained in this deeper water increased in quantity and became of much larger average size, so that the anglers who complained of the dam at first, readily admitted the substantial benefit to fishing which had resulted. In the Grand river in Ontario a dam was erected near Dunnville. Owing to complaints that fish could not migrate up the river, and that the dam obstructed ascending schools, a fishway was erected; but it proved wholly useless. Fish, however, above the dam began to increase, and angling greatly improved, for such fish as black bass and pickerel and pike perch spawned, and the schools of young were retained and could not leave the river, hence the fishing was in every way benefited. The local anglers appreciated the situation, and adopted a system of netting bass and other fish below the dam and transferring them to the deeper waters above, where they permanently remained. Now, the canals and reservoirs which form so important a part of all schemes of irrigation provide the very conditions for similar fish culture work. As a rule the lakes and streams in northern areas, where irrigation systems are being carried out, are shallow, often not very pure, and frequently affected by saline and alkaline elements, reduced or dried up in summer, and frozen to the bottom in winter, and thus afford every condition unfavourable for fish. A wholly new condition is created by the construction of canals and reservoirs under irrigation schemes. Large bodies of water, deep, cool, and free from excessive impurities are created, and a great opportunity arises, therefore, for turning them to account as fish-producing constructions. Irrigation canals might become angling preserves, or, if of large dimensions, sources of fish food for the communities in which they are located.

What then are the possibilities of securing fish production in such larger reservoirs or canals? Insect food usually establishes itself in a very short time, often in a few months after water is admitted; various fresh-water mollusks, water snails, etc., are carried by birds, and rapidly become numerous. But the food conditions necessary for fish could be hastened by the transference of such aquatic life from other waters. Species of small minnows (always excluding the destructive and harmful sticklebacks, small fish with three or more sharp spines on their back) will require to be introduced in most cases, as there are few large kinds of fish which do not prey upon these small species or feed upon their spawn and diminutive fry. But the question of food for fishes need cause no concern as both minnows and insect food and water snails will rapidly increase soon after they are introduced. It must, I fear, be taken for granted that the finest game fish, such as the various western trouts and graylings, are not suitable. They must have rippling, rapid water, gravelly shallows, and the conditions generally which are characteristic of mountain streams. The eggs of such fishes also are deposited, and the young fish hatch out on sandy or

gravelly areas, where the water is swift and sunlight finds access to hasten incubation. There are, however, many species of fish whose eggs are tenacious and glutinous which develop successfully in comparatively still water. Much is to be said in favor of the yellow perch, an active, handsome fish, which affords considerable sport, especially large, strong specimens, and which deposits ribbon-like masses of stick-like eggs in spring. These eggs cling to submerged beams, gate posts, water plants, etc., where the sunlight has access, and the young fry hatch out in a week or ten days. The perch, in my opinion, is a sweet and acceptable table fish, the best of "pan-fishes," one American writer declares, though the bones are numerous as is the case with most fresh-water fish, apart from the trout family. While the yellow perch is not highly esteemed by Canadian anglers, it has long been valued by European sportsmen, and is praised by many authorities in the United States, and on one occasion while fly fishing for black bass in the upper Ottawa waters a large two-pound perch took my fly and was so strong and fought so fiercely that for a little while I imagined that a good bass was at the end of my line. As the fish failed to break water and did not savagely wriggle to free himself from the hook, though he made strong and powerful rushes, I soon realized that the fish was not a bass. The yellow perch, in other words, is a good game fish, and as it breeds under such conditions as I have specified, is very prolific and rapidly hatches out, it is apt to over-run waters in which it is established and provided with proper food conditions. A fish so hardy and so prolific—possessing good game qualities and excellent on the table—is an ideal species for irrigation reservoirs, and is certain to so increase as to cause no disappointment. Of the jackfish and suckers I need say nothing. They have tenacious spawn which adheres on any surface under water with which it comes in contact. They are really not game fish, nor are they first-class table fish, although the western pike or jackfish is a firmer, sweeter fish than the eastern pike. All fish, of course, have some value, and the inferior kinds are better than no fish at all; but the jackfish is a fresh-water shark and should not be encouraged. Most of us, at any rate Canadians, do not value highly any of the catfish family. Their slimy, smooth bodies, grovelling habits, and numerous projecting whiskers or feelers render them very unattractive; but they are really fine food-fish, and most excellent if properly served upon the table. Some angling authorities even include them amongst sporting fish. There is one species which in most respects is superior to the rest, viz., the large channel catfish. The channel catfish is found in the Great Lakes and the connecting rivers and is one of the best of table fish, while its voracity and strong and powerful motions when hooked entitle it to consideration. Its eggs are gummy and cling to any object under water, though it is said to construct a rude nest of stones and to guard the eggs and fry. My own opinion is that it does not always do this, though many of its smaller congeners are nest builders and most assiduous guardians of the eggs and young.

Of the black bass I need not say much because their introduction in irrigation reservoirs might cause disappointment. They are inordinately voracious, and not only clean out other species, but devour each other. Hence few bass can be maintained where a far greater number of yellow perch, or other species, would live and flourish. The bass build nests in comparatively shallow water, 3 to 6 feet deep. It would be necessary to construct long shelves or platforms of concrete or of wood covered with gravel, in order to create shallow nesting areas. Even the yellow perch would increase more favourably were such platforms provided, sloping from 3 feet to 6 or 8 feet, in order to avoid risk of freezing when the eggs are first deposited in May or even April. Wall-eyed pike, or pike perch, are fine fish, but they must have shallow gravel spawning areas, and running water is really a necessity to produce the best results.

There is, therefore, quite a future for the fish possibilities of irrigation canals; but it is necessary to guard against the destruction of the schools of young by devices to prevent their reaching the system of ditches and "laterals" whereby they may be stranded on the land. Wire screens of various designs have been tried. These are

essential at the intake or inlet of all ditches or canals, supplied from mountain streams or rivers abounding in trout or superior fish. A fishery officer testified before the Alberta Commission, 1910, page 95, part 2 of their report, that "irrigation ditches are a great cause of destruction. . . . the screening of irrigation ditches is possible if properly done." One experienced witness said the harm done was small. He said (page 96): "I have had much experience with ditches, especially from the Elbow river. Pike and bull trout come down, but only one or two cut-throat trout."

Another witness said, "the streams are being depleted too fast; but I don't think irrigation ditches have done the harm. I never saw trout in irrigation ditches or trapped in pools overflowed. I have seen suckers and grayling; but trout are too smart, and are never taken in irrigation ditches." No doubt the harm to fishes alleged to be due to irrigation ditches has been exaggerated; but it is best to guard against risks and I agree with an old rancher in the foothills, near High River, who said: "At the head gates there should be screens. They would not clog as there is not enough rubbish to cause much bother."

On the prairie proper, as I have said, the object of screens would be to prevent the fry from wandering out of the main canals or reservoirs into the smaller ditches, and revolving screens have been tried with success.

Dr. Henshall's device is the simplest. It consists of a short flume at the head of the ditch, with enough fall to operate an eight-bladed paddle wheel, fitting the flume closely. In a wide ditch, and correspondingly wide flume, two wheels would be best. The bearings of the shaft work in a vertical slot so that any hard substance can pass under by raising one wheel. The splashing of the paddles frighten the fish and they make no attempt to descend. A revolving cylinder or drum of wire can be added, working in the opposite direction outside the paddles and actuated by pulleys from a shaft, the belt being crossed so that wheel and screen revolve in opposite directions. A device similar to Dr. Henshall's was invented by Mr. W. Parsons, Fort Bidwell, California. It is United States patent 1166628 and the water wheel and wire drum revolve in opposite directions, but it has gear for carrying driftwood and rubbish over the screen. Mr. Julius Dreher, Detroit, has a simple paddle device in a flume with prongs as well as paddles to stop fish. It is United States No. 1150348. The most elaborate revolving screen is that patented by Mr. H. Broberg, Warm Springs, Montana, United States patent No. 1147301 (1914), which rotates on a vertical, not a horizontal, shaft, and ingeniously devised to keep fish from passing through, while preventing clogging by rubbish.

If simple screen devices were installed at the inlet of irrigation ditches I see every ground for regarding the larger canals and reservoirs as offering great possibilities as fish reserves, where suitable species would find location for spawning and hatching out the young fry by retaining the schools of fry season after season, and preventing their escape into ditches and laterals supplied with water from the reservoir. Facilities for sport would be ensured, and local needs in the way of fish for the table provided within certain limits.

Any scheme for converting irrigation canals and reservoirs into such fish reserves in the western provinces would have my hearty support, and would in my opinion be entitled to every aid from the Fish Culture Branch of the Dominion Fisheries Department.

CHAIRMAN: The last two papers remind us very much that little has as yet been done in the way of developing Canadian resources. I now call upon Mr. F. H. Auld, Deputy Minister of Agriculture, Regina.

Mr. AULD: Those of you who have followed the successive conventions of this association will have noted the very original and effective designs which have been issued from time to time announcing the various meetings. I have in mind one that



was issued in connection with the Lethbridge convention four years ago. It was a picture showing a bridal party and underneath was the legend, "The Union of Sunshine and Rain." That brings to my mind a thought in connection with this province of Saskatchewan. Saskatchewan has been charged with being lukewarm towards irrigation, but we have not been inattentive, as some of you know. We may have watched Miss Irrigation from afar off, but we have had a certain disguise in regard for her and have endeavoured to make a closer acquaintance. Last year at Kamloops there was a good representation from this province and district. You know the old story of Miles Standish's courtship when he was too busy, irrigating alfalfa, I suppose, and sent somebody else to "speak for him," with disastrous consequences. But last year we had a gentleman whom you all know well speak to Miss Irrigation on behalf of this province and while she did not declare herself too readily, yet Mr. Williamson spoke so effectively on our behalf that Miss Irrigation came to visit us, and we are very glad to have you here to-day.

The question of irrigation is really not very much to the fore in this province at present, and it is therefore very appropriate that this convention should be held in this town of Maple Creek as it is in this district and in the Cypress hills that irrigation development in Saskatchewan has taken place. The Cypress Hills district is practically the limit of the irrigation development in Saskatchewan. The Cypress hills, as you know, is an old ranching country. The hills are probably 75 miles long with a less distance from north to south, and extend past the boundary line into Alberta. They also contain the highest point in this province, which is about 4,250 feet above sea-level. In the Cypress hills we have old Fort Walsh, which I believe was the original headquarters of the Mounted Police in the days when the Indians and the whisky traders were worth watching. Irrigation work in the Cypress hills consists of probably 275 to 300 individual projects. In comparison with the big irrigation enterprises in Alberta and British Columbia, these individual projects may look small or unimportant, but we are beginning to see that nothing is too small for production in these days and that serious consequences may hinge on small things, and these small irrigation projects are deserving of more consideration than they have received in the past. The irrigable area amounts to approximately 100,000 acres.

I was impressed by an article which I read recently on agriculture in Denmark. That little country, with only a little more than 15,000 square miles, is very small indeed in comparison with Saskatchewan, which has an area of a quarter of a million square miles. The area of Denmark might be compared with that portion of Saskatchewan from Swift Current west to Alberta and from the Saskatchewan river to the international boundary. That section is just about the size of Denmark, but in Denmark they have over 1,500 creameries. They have 64 pork packing plants, which handle annually about 2,000,000 hogs, valued at about \$30,000,000. They have 500 egg-gathering centres. That is an example of intensified agriculture. It is true that their labour conditions are not comparable to ours, and market and soil and climatic conditions are different from ours, but if irrigation means anything it means intensified agriculture, and when we get our irrigation work going as we should, we may look for results in the direction of more intensive methods.

But in the Cypress Hills regions we have not yet made the progress we are hoping to make in irrigation for the reason, as Mr. Peters pointed out, that reservoirs are necessary in order that we may have the water when water can best be employed. Perhaps these reservoirs would be more readily obtained if we had legislation enabling several irrigators to take joint action. We have no legislation in this province regarding irrigation districts such as is in force in Alberta, but we have legislation in regard to drainage districts which embodies the same principle and I venture to suggest that if the getting of legislation regarding irrigation districts is going to aid in the solution of that question, our president and his colleagues of the Saskatchewan Government might be asked that legislation be passed to permit individuals

to get together and develop necessary storage systems. We have in Saskatchewan a local government board which has to approve the sale of securities of this nature, and I believe that the approval of their securities by the Board would assist our irrigators in financing the cost of irrigation reservoirs.

While we believe that there is a great future for irrigation in this district it may not be amiss to recognize the progress in other lines of agriculture which has already taken place. We had more than one hundred thousand farmers at the time of the last census, and their annual revenue is now between a third and a half billion dollars. Grain is of course the main source of revenue, but live stock and live stock products constitute an ever increasing percentage. For the reason that we have made some progress in improving marketing methods I propose to make a brief reference to what has been done to realize maximum returns to the producers without adding to the burdens of the consumer.

The facts are so well known regarding the system which has been built up for the marketing of our grain that extended reference to it is unnecessary. The big line of Saskatchewan Co-operative country elevators is now being given a terminal outlet which should be of great value.

Older, however, than the farmers co-operative elevators are the co-operative creameries, of which our Assistant Dairy Commissioner will speak to-night. The several locals are now merged into one large, strong co-operative concern and this company should have a bright future. The number of creameries and their output have largely increased since 1907.

Another line of effort which has proven quite popular is the co-operative marketing of live stock by live stock shipping associations. The Co-operative Organization Branch of our department promotes this work and supplies an experienced man to assist associations in handling their first consignments. Not all of the associations, nor even a majority of them are shipping their stock co-operatively, but those which are doing it are enlarging their business and this is bound to increase, as the principle is absolutely sound.

Our co-operative branch also acts as a marketing agent for wool and poultry, and as a medium for the exchange of information for those who have articles for sale or are in the market to buy. Wool marketing was taken up four years ago and the department was able, by economical handling and the concentration of wool in one lot to get better prices than had previously been obtained. Each year has shown an increase in quantity as well as in price, and a marked improvement has been effected over old methods when the local merchant received the wool in trade and shipped to his grocery jobber who supplied the wool jobber who sold to another speculator or to the manufacturer. To-day, the number of middlemen has been lessened to the benefit of the producer who sold his wool locally as well as to the man who used the services of the department.

The same remark applies to the co-operative poultry marketing work of the department, which has been carried on for two seasons. The result of this has been the standardizing of prices and a larger net return for poultrymen.

In the dairy work as well as the poultry and wool marketing work the same principle prevailed. The government official assumed full charge of the work, paid the patrons an advance and the balance as soon as the product was sold.

These few illustrations of what may be accomplished all tend towards more intensified agriculture and hasten the day when larger production will be in evidence and aid the introduction of co-operative marketing of our products. The live stock industry in this province is receiving the special attention of a commission appointed by the province of Saskatchewan to investigate conditions and make suggestions as to what improvement is necessary in marketing of live stock and live stock products. The inquiry is still going on.

It is a little disappointing at this season to realize that we are not going to have as bountiful a crop as we hoped to have a few weeks ago. We need it for national reasons

and we need it ourselves for economic reasons. We are, however, by present indications going to get just as much money for our grain as we got last year, and we got as much last year as we did in 1915. Many farmers, however, will have bumper crops if East present promises are realized. There is, however, a fact that is not so comforting and of fact that is the production of coarse grains in Western Saskatchewan this year is very low solution. The oat crop in some districts is practically a failure and the effect that is going to point have on the live stock industry is detrimental. mus

There is, however, in all this a good feature, and it is that, apart altogether from "be the larger attention which may be given to irrigation and the greater impetus which be r that branch of farming may receive, there has been a great stimulus to the better appli only cation of dry farming methods. Down through this district which has been settled by tion grain growers for only a few years, and taking the whole country east of here as far as of the Soo line, there has been great improvements in farming methods, and whereas in 1914 there was a total and complete failure in many districts in the southwest, there in is to-day practically no district that cannot show good summer fallow fields of wheat for which indicates that there is now such a mastery of conditions as will make it possible to have good agricultural results irrespective of dry seasons.

A disappointing feature of the crop situation to which I referred is the short crop of coarse grains in certain districts in the western part of the province. I am res hopeful that it will not be necessary to sacrifice unfinished hogs and cattle as was my done in 1914, and I think that breeding stock can be carried over with a careful I s husbanding of our fodder supply. Any adverse effect on our live stock industry is are greatly to be regretted at this juncture. We have for several years past been laying I the foundation of a provincial live stock industry by buying up suitable breeding sh stock of both cattle and sheep and supplying farmers without the necessary cash to wi pay in full for their purchases, selling with a small cash payment and accepting yo notes payable in one to two years with interest at 6 per cent per annum. This work was carried on under the provisions of our Live Stock Purchase and Sale Act and has been instrumental in starting a great many new herds of cattle and sheep. A part of the policy is the distribution of good pure-bred bulls, boars and rams. This year we are prepared to spend a quarter of a million dollars for the purchase of live stock for sale on credit terms. In this work we endeavour to supply stock at cost. This of course includes the cost of purchasing the animals as well as the purchase price of the animals supplied.

Our duty these days, however, is not limited to production. A very important phase has to do with conservation. Dr. J. W. Robertson told the people in Ottawa a short time ago that it was estimated that five million people will starve to death in Europe during the next twelve months. I presume that a great deal of suffering will occur in the war-devastated areas, especially among the older people and young children, but the efforts at food conservation which are being made in Great Britain and in the countries with which we are allied emphasizes the importance attached to food conservation. In fact we have a Food Controller in Canada. The problem here, however, is different from that of the British Food Controller. We must conserve in order that our exportable surplus may be increased. They must conserve lest their production and importations of foodstuffs combined should be insufficient. I do not know what methods will be adopted in order to aid the Food Controller in the conservation of foodstuffs, but it is my opinion that all the public needs in order to bring about the greatest possible saving of our food supply is to know the facts. Any effort or sacrifice that is needed will be made. I cannot, however, believe that our western people are extravagant in their food requirements. We may have been and probably were extravagant in the boom days a few years ago, but the high cost of foodstuffs to-day is having a wonderful tonic effect in so far as conservation is concerned.

One who reflects on this question can not but realize the importance that is attached to production, and production to-day in Western Canada depends on more



man power in order to cultivate more acres and to cultivate better the acres which are now being farmed. Judging from the reports which we are getting from the East it would appear that there is hardly a province of Canada which has a surplus of farm labour and the outlook for the handling of our grain crop is serious. Some solution of our labour problem must be had if production is to be carried to the point which appears to be so vitally necessary, but whatever we do in this direction must be characterized by thoroughness and careful work. "Better farming" and "better business methods in farming" must be the slogan, so that the utmost may be realized for the labour which is put into our farm operations. If we get that not only will we assist in the present crisis, but we will assist in building up better institutions and better living conditions in these broad prairies and in the fertile valleys of our sister province of British Columbia. (Applause.)

CHAIRMAN: The information which Mr. Auld has given to us as to the conditions in Europe is most astounding and is indeed a very serious affair and shows the need for more attention to our agricultural work.

With reference to Mr. Peter's address. At the last convention of the Cypress Hills Water Users' Association I made a resolution, which, unlike the average New Year's resolution, was carried out, and that was to make a trip to the Cypress hills. I find myself intensely interested in those individual projects in that district and I feel that I should make myself more familiar with them. We have drainage propositions which are practically identical in principle so far as the cost and allocation is concerned and I will give this convention my assurance to see whether the time has come that we should have similar legislation in this province as they have in our sister provinces with regard to the individual irrigation projects. (Applause.)

We will now adjourn to meet again at eight o'clock this evening and I would ask you to be here promptly in order that we can keep to our programme.

## EVENING SESSION—WEDNESDAY, AUGUST 1.

CHAIRMAN: The first speaker of the evening is Premier Martin, whom I have much pleasure in introducing.

Premier MARTIN: I am very glad to be here, and as a member of the Government to welcome the delegates not only from Saskatchewan, but also from British Columbia and Alberta. I also understand that there are some here from the United States, although not as many as in former years. Now since the United States has cast its lot in as an ally of Great Britain that fact will I think further cement the friendship between these two great countries in years to come.

Only in one section of the province has the question of irrigation been discussed to any extent. In the eastern portion in which I reside we do not hear very much about irrigation. In the southwestern portion there are, however, many irrigation projects. You who are here know a great deal of irrigation in the province in which you reside and you also know the trouble that there is in educating people to the need of irrigation in this portion of the province. There was a time in Alberta and South-western Saskatchewan from 1885 to 1895 when there was nothing but dry years apparently and they taught the people in those portions of the country the need of irrigation projects. After 1895 and for the last 15 years or 20 years we have not had a succession of dry years, yet the expenditure of money on irrigation has been justified on grounds of ensuring against dry years that might occur and one has occurred in the present year.

I think gatherings of this kind are to be commended. The great question before the people of this country and the United States is the question of production. In this country and the United States we are supplying men and means against autocracy which has grown up in Europe. From the United States great quantities of ammunition have been sent and also from Canada for some years now. Of late there has been a campaign for more production and the farmers in Canada and also in the United States are rising to the occasion and are putting forth greater efforts than before the war began. Patriotism and production are going hand in hand since the war began and I think we can make the statement that the man who is making two blades of grass grow where one grew before is a greater patriot now than before.

Now as I said before, I came here merely as a representative of the province of Saskatchewan for the purpose of welcoming the delegates from other parts of Canada and the United States and I might add that I truly hope that your discussions and addresses will lead to great benefit not only in this province but in the other parts of Canada. (Applause).

CHAIRMAN: The next address on the programme is with reference to dairying. Now dairying has not been gone into extensively yet because I think a lot of us came from the East, just to get away from the amount of hard work which that brand entails, but we are now beginning to see that although it requires hard work yet it is a necessity in agriculture. I may say that since the department has stepped in and taken a large interest in this matter there has been a great increase in dairymen throughout our province. In the northern portion of Saskatchewan dairying has been increasing continually, and I want to give you the assurance that so far as I have been able to size up the situation in this province, it is the man who is in diversified farming that is in the best standing in his town and with his banker. There is no doubt that there is certain amount of worry attached to grain growing exclusively that makes us become prematurely old. The man engaged in the dairy industry has a certain amount of assurance. The province of Alberta has had a start in this line, but we have increased also, but I will say that while we have not been giving preference over British Columbia dairy products, yet our products are fetching as much and in cases more in the market. I will now call upon Mr. F. M. Logan, assistant dairy commissioner, province of Saskatchewan, to address us on "Co-operative Dairying in Saskatchewan."

### CO-OPERATIVE DAIRYING IN SASKATCHEWAN.

Mr. LOGAN: Mr. President, Ladies and Gentlemen.—I was thinking while sitting here this afternoon and listening to the excellent addresses, that it is a good thing for you irrigationists to get together once a year to compare notes and talk over your successes and reverses. A few days ago I was reading of a bankers' convention held in the East, when one banker said, "It is a good thing for us to get together once in a while to decide what should be done, who should be done, and who should do it," but of course the ideals of irrigationists are altogether different. I have had a little experience with irrigation in connection with a farm I have in British Columbia. Two years ago I spent all the spare cash I had and about all I could borrow to put in an irrigation system. That year it rained so much we did not need any additional water. We grew one hundred bushels to the acre of oats without irrigation. The next year we put in several acres of potatoes and I had a man who had little experience with irrigation, but who was anxious to learn. He thought water would be a good thing for the potatoes, and the more the better, so he rotted most of the potatoes, and I got no returns that year. This year probably the pipe line will blow up or the supply of water give out, so I am not looking for any beneficial results. But speaking about getting together. In looking around the walls I see the Union Jack along with the Stars and Stripes. This is a good thing and the people living under those flags should have gotten closer together years ago.

Now I did not come here to tell you stories but rather to tell you something of co-operative dairying in our province. I was surprised, to say the least, to receive a letter from your secretary asking me to speak at an irrigation convention on the subject of dairying. In earlier days, among some farmers at least, irrigation was closely allied with dairying, but the discovery and practical application of the "Babcock Test" has done much to disassociate these two subjects.

If I should tell you what I think about co-operative dairying in Saskatchewan you would think I was prejudiced in my opinions or was probably dispensing "warm ozone," but when I state that I have been associated with the dairy branch for only a little over two years and can claim little, if any, credit for what has been accomplished, you will, I hope, accept my statements without discount. The credit for what has been achieved in co-operative dairying throughout Saskatchewan is due in a large degree to the spirit of co-operation among the people and to the untiring efforts of the man who for the past ten years has filled the position of Dairy Commissioner, Mr. W. A. Wilson. I must not forget to say, however, that he has been most ably supported in this work by your chairman, the Hon. W. R. Motherwell, who during these years has occupied the position of Minister of Agriculture. Had the Dairy Commissioner not been given this support, the results to-day might have been quite different.

### *Co-operative Dairying Unique.*

Co-operative dairying in Saskatchewan is, to say the least, unique. So far as I am able to learn it has developed along lines distinctly different from those followed in any other part of the world. It is true that co-operative dairying was first introduced in this province in the early nineties by the Dairy Department at Ottawa, but Ottawa proved too far from the scene of operations to manage successfully a business involving as many details as that of dairying, with the result that of the thirteen creameries built during these years, all except two were obliged through various causes to close their doors.

In 1905 the Hon. Mr. Motherwell joined the Saskatchewan Government as Minister of Agriculture under the leadership of the Hon. Walter Scott. It did not take him long to realize that, in some districts at least, the farmers of Saskatchewan could not live by wheat alone, so he established in connection with the Department of Agriculture a branch of dairying. The work of enthusing the farmers of Saskatchewan in dairying was not an easy task. Many of them had been lured to the West with the idea of making a fortune in grain growing and to get away from the close application to details necessary in successful dairying. The fact that co-operative creameries previously established had proven failures militated against the starting of new ones. Returns for dairy products were at that time low, and it was only by obtaining as large an output as possible and by keeping operating expenses at a minimum that a price could be paid for cream which would induce farmers to engage in this line of agriculture.

The usual custom throughout Canada in connection with co-operative creamery management was to appoint a board of directors from among the local shareholders and the business therewith, except for some suggestions from the Ottawa Dairy Branch, was conducted by them. It frequently happened that these men had little or no experience in the operation of a creamery, with the result that mistakes were often made which were fatal to the success of the enterprise and the closing of the creamery was in a great many cases the final result. To prevent further failures the Minister of Agriculture decided that when requested by any co-operative company the Dairy Branch would operate its creamery with little added cost to the company. This management consisted in employing help, purchasing supplies, paying the patrons, keeping the records, and the marketing of butter, and I think I shall be able to show you that large savings have been made, more economical management and more uniform and better butter has been the result.



In addition to the actual management of these creameries, the Government has also given financial assistance. In many localities where creameries have been established it would have been extremely difficult to sell sufficient shares to build and equip a modern creamery, so the Government loaned many of these companies from one to three thousand dollars each on long terms and at a favourable rate of interest. About \$27,000 has been loaned in this way and over \$20,000 has since been paid back. By each company paying a few hundred dollars annually from its current revenue has made the tax on the farmers for the establishment of these creameries exceedingly light, and to-day they have a very valuable property practically free of debt. It has cost the Government practically nothing to provide this financial assistance.

To obtain an adequate supply of cream which was essential to economical operation it was necessary to provide in some cases for bringing cream a long distance which meant increased express charges. To overcome this difficulty the Minister of Agriculture persuaded the Government to pay express charges on cream from the current revenue of the province. This made it possible to bring shipments from districts not sufficiently developed to support a creamery and at the same time aided established creameries in keeping down the relative cost of manufacture. This system, however, was not adopted as a permanent policy, and as the creameries became stronger and dairying became more popular this financial assistance was gradually withdrawn and for the past few years only new creameries during their first year of operation have had their express charges paid from Government funds. While this policy was criticized rather severely at times the results have proven that it was wise legislation.

### *Cream Grading.*

One of the features which has contributed in no small degree to the excellent reputation now held by the butter made at these co-operative creameries is that of grading the cream. In most of the older provinces in Canada no attempt has been made to pay for cream according to its quality. Thousands of dollars have been spent by these provinces in issuing bulletins; thousands of lectures have been given and thousands of inspections have been made, all urging farmers to take better care of their cream, but when the cream arrived at the creamery no selection was made, and one farmer received as much money for sour, badly flavoured cream, as another did for sweet cream of good flavour, with the result that little or no progress has been made towards improving the quality of the cream delivered.

One of the leaders in scientific dairying in Ontario stated at a recent dairymen's convention that the creamery butter produced in Ontario was not as good to-day as it was twenty years ago, and he attributed the cause to poorer cream which had resulted largely from the use of improperly washed hand separators. In 1912 the Dairy Branch adopted the system of grading cream and paying for it according to its worth or quality, and to say that this system has done more to improve the quality of cream received at the creameries than all the other methods employed is not exaggerating. Cream shipments are divided into three classes, Extra No. 1, No. 1, and No. 2. In making payments for butter fat two cents more is paid for the first grade than for the second, and three cents more for the second than for the third. It frequently occurs that one farmer receives a dollar more for a can of cream than does his neighbour for one of the same size. This is an object lesson for both which needs no further explanation. The good grade depends upon the care given the cream and to get that extra dollar a wise man will give the extra care. The effect of this system has been to so improve the quality that at some of the older creameries over eighty per cent of the cream received arrives in a sweet condition.

A better quality of cream is not the only result. After farmers have acquired the habit of taking more pains with their cream it is natural for them to exercise more care with their cows, to be more particular about feeding them and to keep the stable in a better condition. This naturally leads to a desire to know what each cow is producing and eventually daily records are kept and the work more intelligently carried

nt h. In time many of these men become real dairymen. This evolution will take place  
esta much quicker when farmers are shipping to a creamery where the cream is carefully  
d an graded and paid for according to its quality than if shipping to one where careless  
from methods and poor quality obtain the same financial returns as does cream of the right  
ter quality.

In conjunction with cream grading, a systematic plan of butter grading has for  
bac several years been carefully carried out. Grading depots are operated at four central  
que points in the province where cold storage facilities are, of course, available. Privately  
scee owned as well as the co-operative creameries of the province have been invited and  
deb practically all have made use of the grading facilities.

The system followed by the co-operative creameries might be described briefly  
ope as follows. Particulars of each churning are recorded, such as the pounds of cream  
anc of different grades, the average temperature of this cream when received, the  
of the temperature at which it is churned, time required for churning, temperature of the  
n the washing water, amount of colour used, if any, amount of salt used, time butter was  
from worked, general appearance when churned, and other particulars are recorded. A  
aide large percentage of this butter is packed in 56-pound boxes, the inside of which is  
sten coated with paraffin-wax and then lined with heavy parchment paper. Each creamery  
nge is given a distinguishing letter and each churning a number, both of which are  
aw marked on the outside of every box of butter packed, and even though a box of this  
tio butter is held in cold storage for months or even years, it can be easily traced and  
all particulars obtained.

A copy of this churning report is put in an envelope tag and attached to one of the  
boxes filled from this particular churning. If the contents of this box prove  
unusual in any way the grader can refer to the churning report and probably detect  
the cause. As already mentioned this report shows the amount of cream of the  
different grades and if the butter maker is taking in extra No. 1 and No. 1 cream and  
turning out No. 2 butter there is evidently something wrong and the trouble can  
usually be detected. Upon the arrival of this butter at the grading station one or more  
boxes from each churning is carefully examined and a score card similar to that  
used at exhibitions is filled out and marks given for flavour, grain, salting, finish  
and colour. These cards are made out in triplicate and one sent to the Dairy Branch,  
one to the creamery where the butter was made, and one held by the grader. This  
system provides a constant check and guide for the men who do the work and is  
less expensive and far more effective in producing uniform butter of high quality  
than could be accomplished by the usual system of having inspectors make frequent  
visits to these creameries.

Arrangements have been made with the various railways along which these  
creameries are located to operate a cool car at least once a week between each creamery  
and the grading depots. This provides facilities for having the butter reach cold  
storage in good condition where it is held at a low temperature until sold.

When the butter is sold, grade certificates, showing the marks given each churning,  
and which are equivalent to certificates of quality, are forwarded by mail to the  
purchaser, and before the shipment arrives the buyer knows more about the quality  
of his purchase than if he spent half a day in a personal examination of the butter.  
It is needless to say this system is popular with the trade and many of the dealers do  
not care to purchase butter unless accompanied by a grade certificate. Every precau-  
tion is taken to maintain the standard indicated by this grade certificate. When  
it implies that the butter is No. 1 or special we try to be sure that it is not No. 2.  
The Dairy Branch fully realizes that the reputation of Saskatchewan butter depends  
to a large extent upon the use made of these grade certificates and while their abuse  
could seriously affect the present it could almost ruin the future of the industry.  
The advice of the Dairy Commissioner to our graders has always been that if in doubt  
about what grade to give a churning of butter to err on the safe side and give it the  
lower grade.

In co-operative dairying there is perhaps no feature of more marked advantage than the co-operative marketing of the butter. It is practically impossible to satisfactorily supply the Pacific coast or foreign markets unless the seller is in a position to fill orders on short notice of from one to ten cars. Few if any creameries in Canada have sufficient output to meet these requirements so the only practical way is to get the butter from a number of creameries to be assembled at central points and after grading have it sold through one office. With our system of grading cream and with careful grading of each churning of butter it is possible to have fifteen or twenty or even more creameries produce butter which is almost uniform, so when a dealer buys five or ten carloads of the same grade he knows that his entire purchase might be practically uniform in quality. This feature cannot be duplicated anywhere else in Canada because in the other provinces the creameries are practically all privately owned and operated singly, so there is not the same opportunity of purchasing butter in large quantities which has been manufactured, graded and sold under the control of one office.

By following the system already outlined the butter made by the co-operative creameries of Saskatchewan enjoys a reputation which any province might well be proud of.

Four years ago the dealers on the Pacific coast were willing to pay from two to five cents more for New Zealand butter than they would for any Canadian make. During recent years a gradual improvement has been made in Western butter and I am informed on good authority that to-day the same dealers will pay as much for the butter made by the co-operative creamers of Saskatchewan as they will for the best New Zealand grades, and at the same time will pay from one to two cents more for it than they will for the once famous Eastern Townships' butter.

The Pacific coast, however, is not the only place where this butter can be marketed. A carload was sent to Montreal in March of this year on consignment and the brokers found it so satisfactory that they were able to dispose of it at one and one-half to two cents in advance of local makes, writing that the flavour was excellent and the workmanship about perfect.

As further evidence of the quality of Western Canada butter, I might mention the result of a trial shipment sent to England last fall. The Dairy Commissioners of Manitoba, Alberta and Saskatchewan made up a carload and forwarded to the Bristol market. The brokers to whom it was consigned wrote that it gave excellent satisfaction and they considered it "the finest lot of butter ever received from Canada. With a reputation for quality such as I have outlined it is no exaggeration to say that the butter produced by the Co-operative Creameries of Saskatchewan sells at a premium of at least two cents per pound in advance of what it would bring if each creamery were operated separately and the butter marketed in the same way. With an output of two or three million pounds an additional two cents per pound amounts to a sum of considerable size. Under the co-operative system the farmers who produce the cream obtain the entire benefit of this premium as it costs no more, in fact, less to manufacture butter under this system than it would if each creamery were operated singly.

Three systems have been adopted in paying for cream shipments. At several of the creameries cheques are issued for each can of cream, but for most of the cream current prices are paid by cheque every two weeks, and at the end of the financial year a final payment or dividend is usually available. Last year more than \$17,000 was distributed among our patrons as a final payment. Had these creameries been operated by private companies it is quite safe to say that little if any of this sum would have found its way into the pockets of the farmers.

While development in dairying throughout Saskatchewan has not been phenomenal or perhaps even as great as it might have been during these years, it has been consistent and uniform and an excellent foundation has been laid for the future.

As I have already stated the growth has not been phenomenal, but it has been, I think, more than ordinary. Ten years ago four small creameries were operated with



05 patrons and an annual output of 88,000 pounds of butter. To-day we have 19 creameries in operation with more than 7,000 patrons and while it is too early to state definitely, the output will probably be between two and one-half and three million pounds, and yet this is only a small percentage of what these co-operative creameries will some day produce.

An outline of the co-operative creameries of Saskatchewan would not be complete without some reference to their amalgamation into one co-operative company. While these creameries have been satisfactorily operated during the past ten years it was decided that under the system followed they were not on as permanent a basis as they might be. The custom has been for the dairy branch to obtain an annual lease of these creameries. The tendency in all cases has been to renew these leases, but there was no guarantee that this would continue to be done, and while we might have two or three million pounds of butter to market this year, it was possible that we should have none next year as each company might decide to operate its own plant, so the development of permanent butter markets under such conditions would be far from satisfactory. In addition to the immediate operation of these creameries their future development had to be considered. Work of a permanent nature could not well be undertaken on the basis of an annual lease, so the amalgamation of all these creameries seemed to offer a solution to the difficulty and was undoubtedly a move in the right direction. I predict for the new company a big future.

Its ability to provide an unlimited and profitable market for all the cream the farmers can produce is only one of the services this company can render.

The egg and poultry industry of this province is capable of almost unlimited expansion. It is estimated that there are 150,000 farmers in Saskatchewan, any one of which could keep at least 100 hens, and some of them many more. With 100 eggs to the credit of each hen, which is a low average, it would mean an egg production of 1,500,000,000 and at two cents each would be worth \$30,000,000. With 100 head of poultry to sell from each farm, the revenue from this source alone would amount annually to \$7,500,000 or a total revenue of over \$37,000,000. The farmers interested in dairying will be the first to become interested in poultry and egg production, and through the medium of the creamery and cold storage facilities, the industry can be developed more successfully than in any other way. Seldom if ever has such an opportunity for service awaited a new company.

Another feature which can be successfully carried on in conjunction with the creamery and poultry industry is that of co-operative cold storage. Sufficient work has already been done along this line to demonstrate the usefulness and practical possibilities of these plants. Cold storage warehouses of a practical size can be constructed at central points in the province, and in addition to being self-sustaining can provide storage facilities for farmers in these localities who wish to store their winter's supply of perishable provisions, and also provide storage facilities for merchants, brokers and others requiring such space. This province is in need of fifteen to twenty such plants at the present time.

When we consider the opportunity for development and the still greater opportunity for service, one is forced to the conclusion that the possibilities of the new co-operative company are limited only by the energy and ability the management can give to the enterprise. It is contemplated that the Dairy Branch will retire from the active management of these creameries and that this work will be taken over by the new company about November 1 of this year. Its future will undoubtedly be watched with keen interest by thousands who are personally and financially interested.

Saskatchewan has been singularly successful in co-operative undertakings, and I look forward with confidence to the time when the Co-operative Creameries, Limited, will prove one of the most successful.

The CHAIRMAN: I would like to supplement and probably accentuate one of the points made by Mr. Logan. We do not wish to say that we make better butter than any one else, but we do say that whatever certificate we attach to the butter we live

right up to it, and that is what commends our butter to the buyers. Mr. Wilson's certificate on butter is getting to mean just as much as Mr. Peter Horne's certificate means on grain in the Liverpool markets, and the buyers know that whatever their certificate calls for the grain will be found to be the same. I visited the big export dealers in Vancouver and I got first hand from them the statement that they could always bet on Mr. Wilson's certificate and that as long as that would be the case they would be glad to get our products. You have been reading about the alleged atrocities in cold storage in Ontario. We do not desire to start anything of that kind in connection with our cold storage plants. If the consumer believes that such might be started here all they would need to do would be to buy their butter and case in and their meats too, buying it at the time they wanted to and then store it in our cold storage plants, as by law they are entitled to store whatever they buy. I may say that the cold storage plant at Wanda is used by farmers living within fifty miles around there.

We believe in each district forming its own conditions for its particular industry. If it is grain growing, then grow grain, and if it is ranching, then ranch, and if dairying, then carry on dairying. We believe in diversified farming. You take the districts of Wadena and Lloydminster where the established industries are oat growing and dairying. There are districts more adapted for grain growing than for dairying. Whatever your district is adapted for work under those conditions and diversify in other respects. We would not think of recommending dairying in places where it is not suitable. We believe to-day if we had three or four inches of water at the right time on our pastures in Saskatchewan that it would increase our dairy output by 25 per cent.

### THURSDAY MORNING SESSION—AUGUST 2nd.

CHAIRMAN: The first speaker this morning is Mr. James Johnstone, of Nelson, British Columbia, who will speak on "Interprovincial Co-operation."

MR. JOHNSTONE: The greatest permanent prosperity of the Canadian West will in future depend upon the extent to which co-operation is entered into between the farmers east and those west of the Rocky mountains.

Here on the plains you produce the finest wheat in the world, which is the staff of life, and the chief food for man and beast throughout the world.

On the Pacific slopes in British Columbia we can also produce the finest of grains, but owing to the expense of clearing and preparing the land for its cultivation we do not attempt to produce grains in competition with the farmers on the plains. We in British Columbia are situated in a climate and amid surroundings which produce the very finest of all kinds of fruits which are indigenous to the temperate zone. Fresh ripe fruit is one of the most healthful of foods and is essential to maintaining the body in perfect health. You of the plains, therefore, require our fruits which we produce to perfection, and we of the mountains require your grains, not only for ourselves but for our flocks and herds, the maintenance of which is essential to the continued fertility of the orchards. As we in British Columbia require your products and you require ours, and as we are all producers direct from the soil, we should devise some better means of interprovincial co-operation than we have at present—which is in reality no co-operation whatever.

The distance between these areas of greatly diversified production is only a few hundred miles, far nearer than any other diversified areas of a similar character.

Such proximity should be of the very greatest commercial advantage to the producers in British Columbia, Alberta and Saskatchewan, but we are not taking advantage of it as we should.

We, in British Columbia, purchase a large tonnage of feed and grain from the States lying to the south of us, which we should purchase from you; and you should purchase a large quantity of fruit from the States lying to the south of British Columbia which you should purchase from us. Now this lack of what I might call national co-operation and fore-thought is certainly not caused by quality. Your wheat and farm products stand first in quality, not only on this continent but throughout the world, and our fruit has won the highest awards for quality at the Royal Horticultural Society in London and at various exhibitions throughout the United States. Only last month I received from the Secretary of the Panama Pacific International Exposition their gold medal and diploma for a variety of cherry which was not only originated in California, but which is considered the best cherry grown in the States. They also awarded me a diploma and their silver medal for an European variety of cherry. With these facts before us surely you should get the best of fruit and we the best of grain and feed, but we do not do so by any means, and it is our own fault. Providence helps those who help themselves, and so far our past want of co-operation does not deserve anything better than we have been receiving. I often see fruit for sale in the city stores of the prairie provinces which no British Columbia man would touch and which even his pigs might not relish at home, and I have often purchased milling feeds at high prices (\$40 to \$60 per ton) which contained a large percentage of crushed straw and as for No. 3 wheat purchased for chicken feed, I am certain your plump hens would pass it by and not recognize it as feed fit for them.

This fearful war in which we are engaged has taught us the vital importance of developing our own resources within the Empire, and thus in times of emergencies to be absolutely independent of our supplies from foreign sources.

During the strenuous conditions in which we are living too great stress cannot be laid upon the importance of interprovincial co-operation. It should be our privilege and duty to co-operate in every way and assist each other by using each other's produce. If we do not do so, others will circumvent our wonderful opportunities; other fruits of perhaps less nutritive value may come into general use and even your famous wheat may not always be held essential. Even now in Denver, Colorado, a factory is turning out bread, cakes and biscuits which are claimed to be delicious and of greater food value than those made from wheat or oats. Let us then be up and doing—boosting and using our own good products among ourselves, for every dollar we send out of Canada is lost to our country. Out of every dollar we exchange among ourselves a certain proportion will again return to our pockets.

Individual effort will accomplish the desired end better than any association or organization which might be formed. Let us each one purchase home-grown and home-manufactured products only and our dealers will soon cease to purchase goods which we leave on their hands. In some instances we might have to be put to a little inconvenience for a short time, but surely we should consider such small sacrifice a privilege in being able to do our bit in the upbuilding of our Empire's resources.

CHAIRMAN: Mr. Johnstone is kindly allowing Mayor Annable, of Nelson, B.C., a few minutes of his time to say a few words.

MAYOR ANNABLE: As I have to leave the convention this evening, my friend, Mr. James Johnstone, and myself desire to invite the members of the Western Canada Irrigation Association to hold their next convention at Nelson. I believe it has been the custom for the convention to alternately visit the prairie and the mountain section, and next year it is due to visit British Columbia. We adopt the dry farming method more in the vicinity of Nelson. We not only cultivate the surface of the earth in our country, but we dig down some hundreds of feet and we dig out wealth from the ground. From Government statistics British Columbia has produced \$454,000,000 from the mountain depths of the earth in minerals. Gold having a standard value is not any greater than before the war, while copper, lead, zinc and silver are double



their previous price, therefore gold mines have almost ceased to operate and copper, lead and silver mines are operating to their fullest extent. One reason for the closing up of the gold mines is on account of the labour required to develop those lead, copper and other properties. Gold having a standard value is the same any time what it is taken out. Therefore when labour is cheaper and powder one-quarter of what it is to-day, the gold mines will then start operating again. While I do not wish to take any advantage in getting in ahead and inviting you to Nelson, the reason I am doing this to-day is because I will have to leave this evening.

If you can come to Nelson next year we will try as citizens of that city to keep up the hospitality which has been extended to the association at the other places where the conventions have been held. Although the standard has been set rather high, we will endeavour to keep it up. We have the largest motor boat fleet in America in proportion to the size of the city on Kootenay lake. We have the largest smelter in the British Empire having a pay-roll of \$200,000 a month. If you will come there we will endeavour to arrange a trip to the smelter and a trip on the Kootenay and also a few hours under Mr. Johnstone's cherries.

The word "Kootenay" is an Indian name meaning "water people." Now, while we are particularly fond of water we would say that we have not yet banished from our midst the refreshments that you have done away with, but if we have not by the time you come and you should forget that it is water you are accustomed to drink, we will do our best to take care of you. (Applause.)

CHAIRMAN: You will see that we are not at least going to be homeless for our next convention. We have five minutes left for discussion on Mr. Johnstone's paper. There is something left to say in the matter and I might lead you by saying that there is one kind of inter-provincial trade that we should like to have cut out. Speaking generally there is no friendship in trade, but I believe there is a real desire to have inter-provincial trade. When I went to British Columbia in regard to our butter trade I found a real desire in British Columbia to trade with the prairie provinces. However, we must always see that two or three things are provided before we can expect to have development in inter-provincial trade. That is, you must be prepared to give the article the other man wants when he wants it and also at a reasonable price. There is only one trade that we want to have cut out and that is the liquor trade. However, I believe it was only through a fluke that this has not been done. Now, if there are any others who want to discuss the question of inter-provincial co-operation, we should hear from them.

The old saying that there is no friendship in trade is not true, but in my opinion there must not be too much difference between what one province wants to give you and what you want and neither must there be a big difference in the price that the one wants. The economic side of the trade must not be lost sight of. Other things being equal we can always develop inter-provincial trade and co-operation along our lines and also along other lines.

Mr. Don. H. Bark, Chief of Irrigation Investigation Division, Department of Natural Resources, Canadian Pacific Railway, will now address us on:—

### *Alfalfa Growing in Western Canada.*

MR. BARK: I was very-sorry to be unable to be here yesterday, but still I feel that I am somewhat fortunate, for if I had heard what the other speakers had to say about alfalfa I would, no doubt, have been somewhat embarrassed in following them, as they, no doubt, completely covered the subject. You delegates, on the other hand, are perhaps unlucky, for not having heard the other speakers discuss the subject of alfalfa, I am bound to make more or less repetition.

The subject of alfalfa, Ladies and Gentlemen, is such a great one that I cannot hope to cover it in the short time at my disposal, but I shall do my best. Not knowing what the other gentlemen have said on the subject I cannot do otherwise but try to whomever at least certain phases of it more or less completely. I feel and believe that alfalfa is one of the most valuable of the forage crops that it is possible for us to produce in the Prairie Provinces. It excels all other forage plants in yield, low cost of production, feeding value, and beneficial effect on the soil. Though this is an irrigation convention we will have to admit that alfalfa will do very well on dry farms provided a reasonable amount of rainfall occurs. Generally speaking, however, the more moisture there is available the more tonnage of alfalfa there will be produced. It would seldom rain too much in our Western Prairie Provinces for the maximum production of alfalfa, providing the crop is planted on a well drained soil. If it is too dry will for the production of a medium crop of grain on summer fallow one cannot expect a few good yield from alfalfa unless it is planted in rows and cultivated so as to conserve the moisture. There is no doubt that if alfalfa is handled in this manner a fair crop may be produced in all but the driest of seasons. In such cases it is usually possible to produce a very profitable crop of seed.

Time will not permit me to discuss at any length the great value alfalfa has as a food for practically all classes of stock. I think I can take it for granted that most of you already know of its great value as a hay for dairy cows and for beef cattle, as well as for sheep, horses, and hogs. It makes an ideal pasture for hogs and horses, but due to the losses from bloating, in my experience, it is never profitable to pasture either cattle or sheep upon it. I have seen many men who have had long years of experience in this matter, however, and who claim that it is possible to pasture alfalfa without danger from bloat, yet, these same men sooner or later have usually given up the practice. I have not seen sheep or cattle pastured on alfalfa in Alberta. It may be that there is some peculiarity about our climate that will permit the successful pasturing with these two classes of live stock without loss. If any one wishes to try it, the stock should by all means be turned on the pasture only when well fed and full of some other forage. They should then be kept upon the alfalfa and not taken out so as to allow them to become real hungry. One of the great dangers lies in allowing them to eat too much at one time.

As a hay, alfalfa is relished by cattle, horses and sheep, though in some cases they must be taught to eat it at the start. It is practically the only hay that is adapted as a dry forage for hogs. I do not know of any other forage that hogs will eat so much of and do well upon in the dry state as alfalfa. I well remember a man from the East who worked with me in the early days of an irrigation project in Idaho. He had never had any experience with alfalfa prior to coming to the West and was certainly surprised to learn that hogs liked hay. He told how the first western farmer he had ever worked for had asked him to feed the hogs some hay, that he failed to do so thinking that the boss was joking with him, but that he was much surprised when the said boss later on in the day fed the hogs himself and stated, "You ought to have seen those hogs eat."

One of the greatest values of alfalfa to our Prairie Provinces is in the fertilizing effect it has on the soil. We must practise crop rotation if maximum returns are to be made from our crops year after year. There is no soil in Western Canada or in any other section that will stand continuous cropping to grain year after year and still continue to give maximum returns. Some fertilization, either application of manure, or that furnished by a rotation with leguminous crops must be added to the soil. Though we have a fair supply of humus to start with it is not sufficient to raise maximum crops of grain for more than a few years at the most. In the regions further south where but little can be raised without irrigation, there is but little humus in the prairie sage brush at the outset. One can raise very good crops of grain for a couple of years after which the yield begins to decrease very rapidly.

I have seen two farmers move to a new project and settle on sage brush land at the same time just across the fence from one another. One would plant his farm to wheat and the other to alfalfa. The first man would produce forty bushels of wheat per acre the first year, thirty bushels the second, twenty the third, and ten bushels or less the fourth year. The farmer who planted his farm to alfalfa just across the fence at the same time and upon the same soil with the same climatic conditions would plough up his alfalfa at the end of the third year, after having produced very profitable returns during the second and third years, and the fourth year when his neighbour was producing only ten bushels of wheat per acre, the yield on the alfalfa sod adjoining would be eighty bushels per acre of the finest wheat in the neighbourhood. This, of course, sounds like a high yield, but eighty and even ninety bushels of soft wheat have been quite commonly produced on alfalfa sod in the states of Idaho and Utah.

During the past year we have ploughed up some alfalfa on our Brooks Demonstration Farm. It is the first alfalfa sod to my knowledge that has been broken in that immediate section. The farmers nearby mostly admitted that alfalfa would fertilize the ground, but were much surprised to learn that we intended to plant wheat upon it. It was said, it would grow too tall and would lodge, or that if it did not lodge it would never ripen, yet the grain on this alfalfa sod is now beginning to ripen. I will no doubt be cut as early as the average of any of the other grain in that section thus proving, for it has not lodged, that we can grow grain on alfalfa sod and have it ripen normally and as early as grain on other soils, and I assure you that this wheat will be equal in yield of any wheat in that section. I remember the results of experiments carried on by myself and my assistants while in the employ of the United States Department of Agriculture in Idaho, where the yields of grain and potatoes on alfalfa sod were more than double those on similar adjacent fields that had never produced alfalfa. In my opinion alfalfa sod given better results than a heavy coating of manure, and I wish to impress upon you before leaving this phase of the subject, that the value of alfalfa as a fertilizer is second only to its great feeding value.

It is always rather difficult to kill out a good stand of alfalfa. I have actually seen men grub alfalfa out with a grub hoe in their pasture for fear it would bloat their valuable dairy cows even after the alfalfa had been ploughed twice to be sure of killing completely. One of the best methods of killing alfalfa is to plough it shallow in the fall after the last crop is cut. It should then be disced and harrowed thoroughly so as to uncover as many of the crowns as possible in order that the action of the weather during the winter may be as severe as possible. In the spring, after the shallow ploughing in the fall, it should be again ploughed approximately two inches deeper than the original ploughing in the fall which turns all of the crowns underneath where they add considerable fertility after decomposition. Care should be used in ploughing alfalfa in order that all of the roots may be cut. The plough must be kept sharp.

One can see alfalfa grow on a great variety of soil types, varying from the finest of adobe clay to the coarsest of gravel. The soil best adapted to alfalfa is a clay loam of good depth with a medium texture, and it must have good drainage, both surface and subterranean. This crop cannot withstand either water standing on the surface nor at a shallow depth underneath the surface. Given soil conditions like those just described and plenty of moisture furnished by either rainfall or irrigation, and alfalfa should make maximum returns. Where alfalfa is planted on land that is to be irrigated it is well to select a rather good slope of from ten to twenty feet per mile, even fifty feet per mile not being excessive. An average slope of five feet per mile would be considered too flat for good surface drainage. Never plant alfalfa on a pothole or in a depression without surface drainage for, even though you do not expect to irrigate it the water supplied by the melting snows in the spring before the frost has left the ground will be liable to either drown out or damage the crop.



It is a fact which cannot be controverted that any certain crop on a certain soil in a certain season requires a certain specific amount of water if a maximum crop is to be produced. If more water should be applied than the soil or crop needs crop production is bound to be decreased, the decrease depending upon the excess amount of water supplied. On the other hand if insufficient water for the best needs of the crop is supplied a maximum crop cannot be produced. It will be seen, therefore, that for the best results under irrigation one must not only know the needs of his soil and crop but his land must be so prepared that he can apply the certain specific amount required at the proper time. It is therefore apparent that even with irrigation a maximum crop cannot be produced upon all parts of the area unless it is so prepared that the water can be applied evenly to all parts of its surface. For best results, therefore, it is necessary to smooth up one's land, filling the depressions and cutting off the larger knolls with a Fresno scraper, after which the entire field to be planted should be levelled with a home-made float leveller, with which tool I hope all of you irrigators are familiar. Too much stress cannot be laid upon the careful preparation of one's land for irrigation, for, in many cases, the success or failure of the farmer will very largely depend upon his ability to make this even application of water to his field, upon which maximum crop production so greatly depends. The need for the levelling of the land does not apply specifically to alfalfa alone but to all other crops which are produced under irrigation, but, fortunately when the land has once been prepared so that it may be irrigated evenly it can be maintained in this condition for the first and successive crops at but a very slight expense.

There are several types of irrigation systems in use. The first and the crudest system of irrigation ever invented was the free-flooding system where the ditches or creeks are dammed up and the water is turned down the draws and allowed to flood out over the land by diverting here and there if necessary by dirt, brush or manure dams so as to flood out and wet as much of the surface as possible. This system, as has been said, is very crude and is not adapted even to hay meadows, for even distribution of water with it is impossible. Part of the field is bound to get too much water while other parts may not be reached at all. This free-flooding system just described, because of the over irrigation, is bound to make in many places water-logs and spoils much land, after which it frequently costs more to drain and reclaim than an efficient irrigation system would have cost at the outset.

The next type of irrigation system devised was that of flooding between rectangular or contour checks. This type of system was constructed by placing a dyke clear around different areas of the same elevation and flooding the water into these areas enclosed by the dykes until all of the ground surface was covered. This system too has its advantages and costs a considerable amount per acre for its proper installation.

Another system that is now widely used is the furrow system of irrigation where the water is run across the field from the head ditch in small parallel furrows, the water being run in these furrows until the moisture has soaked across and moistened all of the soil between them. These furrows are usually from three to five inches deep and from two to four feet apart, depending on the type of soil encountered. The more porous the soil the greater would be the space between the furrows.

The best system yet devised, however, in my opinion, for the irrigation of alfalfa, is flooding between borders. The land is levelled off much the same way as for efficient irrigation with any other system. Parallel dykes from 35 to 75 feet apart are run down the greatest slope unless this is excessive or more than 75 feet per mile. These dykes are rather broad and low. They should be about three feet broad and about six inches high in the middle so as to permit of the passage of wagons and haying tools without inconvenience. The water is then flooded across the land between these parallel borders or guiding dykes in a very efficient manner. In order to be ideally prepared for this system the slope or side fall between the borders should all be taken out in the levelling, but much of this can usually be eliminated

by laying out the borders in the proper direction at the outset. The time will not permit of a more lengthy explanation of this system, and I shall refer any of those interested to a bulletin published by the Department of Natural Resources of the Canadian Pacific Railway, entitled, "Alfalfa." In this I have endeavoured to describe the preparation of the border system in such a manner that any one with a knowledge of irrigation could readily instal such a system on their own land. This bulletin can be secured by writing me at Strathmore, Alberta.

A compact, clean, mellow seed bed should be prepared for alfalfa. The seeds of this plant are small and the young plants are rather puny at the start. They, therefore, need the best chance that you can give them. Do not plant your alfalfa too deep, never less than one-half inch nor more than one and one-half inches deep is a safe rule to follow. Opinions differ as to the amount of seed that should be sown to the acre. Ten pounds of seed if evenly applied to an acre would place fifty-two seeds upon each and every square foot. Of course, it is impossible to have all of them grow, but given seed of good germination one should secure a very good stand on a proper seed bed with fifteen pounds of seed per acre. This is the amount we are recommending in Alberta. This could be put in either broadcast or with a grain drill. There would not be much difference between the two methods so long as the proper depth of planting was secured. For any part of Alberta or Saskatchewan I should think that the period between May 15 and July 15 would be the best time to plant alfalfa, the sooner after May 15 that it can be planted the better as proper moisture conditions are secured. Do not plant alfalfa with a grain crop. Alfalfa requires much sunlight and will always do better alone. If it attains sufficient height by August 1, it can be clipped. This should be done leaving the first growth on the ground. It is not thought, however, that it would be good practice to clip the first year after August 1, as the young plant unquestionably needs considerable fall growth in order to be able to withstand our rigorous winters in the best possible manner. While there may be some soils and localities in Alberta or Saskatchewan where alfalfa does not require inoculation it is best to be on the safe side and inoculate. Failure to do this probably has been one of the greatest and one of the most frequent causes of failure in the growing of this crop in these provinces. Inoculation can be done either with the culture applied to the seed or by applying soil from the old alfalfa fields that one is sure is inoculated. Any of your provincial experiment stations will gladly give you complete and explicit directions for the inoculation of your alfalfa.

The subject of harvesting the crop is a considerable problem in this section. In order to have the greatest possible feeding value and to bring the best possible price on the market alfalfa must be so cured that it is green in colour, and that as large a percentage of its leaves as possible must be retained. In order to cure alfalfa in this manner it should be cut when it starts to bloom, more properly, when the basal shoots or second growth start up around the crown near the ground. Assuming that it is a drying hot day one should cut the alfalfa in the morning and rake it into windrows in the afternoon; it should then still be moist and sappy but should no doubt be ready to place in small cocks or piles in the afternoon of the second day. In order to cure the crop properly it must not be allowed to bleach but should be cured in as large a pile as possible so that but a small portion of it will be exposed to the direct rays of the sun. The time to stack alfalfa is hard to explain. The alfalfa grower's intuition or sixth sense tells him when to stack. One rule that can be laid down is that water on the hay (from the rain) does more harm than water in the hay. It is usually considered ready for stacking when the stems are so dry and brittle that they will crack, but not break entirely when twisted in the hand. A little practice in regard to this matter will soon tell one when alfalfa is ready to stack. It is needless to say that the hay should be placed in a large well topped, well built stack with as little surface exposed to the weather as possible. It is a good plan, usually to top the stack with plenty of timothy hay as this hay will shed water better than alfalfa.

Before I close I must say something about the hardiness and vitality of alfalfa, as this factor is one which gives considerable concern because of our rigorous northern climate. Alfalfa was originally a desert plant from a region far milder than this, and one hundred years ago could not possibly have lived through one of our winters. It has been brought northward, however, the weaker plants having been repeatedly killed off, thus permitting the seed of the succeeding generations to have been borne only by the most hardy plants in each case, which has resulted in increasing the hardiness of alfalfa sufficiently so that it can be grown with profit and but little loss through winter-killing throughout the greater portion of Alberta and Saskatchewan, provided, however, that only the more hardy varieties or strains are used. Time will not permit me to say more in regard to the history of alfalfa. The varieties that have given the best results in central Alberta are the Grimm, seed from Northern Turkestan, and locally-grown seed. It has not been possible, however, to secure seed of the above mentioned varieties or strains in sufficient quantities and the remainder of the seed required has been imported mostly from northern Montana, which has a climate only slightly less rigorous than our own. The Montana-grown seed has given fair results but has been subject during the past two winters to considerable winter-killing in the central part of our province. Considerable investigation has shown that the Grimm is practically the only seed that has been almost free from winter-killing, and in the future we are going to recommend the planting of as much of this seed as possible. The unfortunate part about it is that the seed from pure Grimm stock is scarce and high in price, but we hope to overcome this factor by producing as much as possible of it at home.

In conclusion, I wish to emphasize a few of the more important factors in connection with the planting, growing, irrigating and harvesting of alfalfa. Do not under-estimate the feeding value, as speaking broadly, there is no other forage we can produce that can compare with it in feeding value, acre yield, and fertilizing effect upon the soil. Be sure that you have secured seed of the most hardy strain obtainable. Get Grimm seed if you can. Plant it on well-drained soil and on a well-prepared seed bed at the rate of approximately fifteen pounds per acre. Inoculate it. Do not plant it less than one-half nor more than one and one-half inches deep. Leave plenty of growth on it the first fall when it goes into winter quarters and see to it that it has a proper supply of moisture, and I believe you will have good success with alfalfa. (Applause.)

A DELEGATE: I would like to ask, if after you have ploughed up your alfalfa and grown two or three crops of other things is it necessary to re-inoculate?

Mr. BARK: It is not usually considered so. It depends upon how long the alfalfa was in there and the proximity of other alfalfa. If alfalfa was planted and growing alongside of the field, I do not think I would. Still, on the other hand, it is easy to inoculate by the culture method. Twenty-five cents worth of culture from the experimental station will give you enough to inoculate sixty pounds of seed, so it would not cost very much to inoculate again and looking at it from that standpoint one could hardly afford to take any chances whatever with it.

The CHAIRMAN: There is one very important point brought out this morning and yesterday in the matter of the destruction of alfalfa. They practically all agree that the movement towards destroying alfalfa is the fall ploughing. If you want to destroy any kind of perennial weed, the time to do it is to attack it in the fall, particularly when the ground is dry. That applies to quack grass, brome grass and even thistles. The time to get your first innings at it is in the fall. Leaving it until spring leaves it in a bad condition for a start. I think that applies to all our weeds as well as the killing of alfalfa and it is something that we desire to know very much in Western agriculture at the present time, particularly with regard to our own grasses, including quack grass.



I now call upon Professor L. S. Klinck, Dean of the Faculty of Agriculture, University of British Columbia.

## FIELD CORN FOR FODDER AND ENSILAGE.

Prof. KLINCK: It is with the greatest of pleasure that I have listened to the practical address of the previous speaker. As Mr. Bark's knowledge of his subject is born of a first-hand working acquaintance with it in all its many details it is only natural that the enthusiasm, which always characterizes him when speaking on his favourite theme, should become contagious.

The subject assigned to me, "Corn and Corn Growing" is one in which the active interest of prairie farmers is increasing from year to year. Twenty years ago, outside of comparatively limited districts in Ontario, practically no attention was paid to this important cereal in any part of Canada. With the development of the live stock industry, and especially with the expansion in dairying, came a demand for a high-yielding, succulent crop which would supply an abundance of palatable roughage at a low cost per ton. Corn was the crop which met these requirements most nearly, and, as a result, its cultivation has become general throughout Central and Eastern Canada wherever the growing period is sufficiently long to ensure its normal development in an average season. To-day we find many prairie farmers evincing a keen interest in this crop, and not a few who are growing it with satisfactory results. Some who have attempted its culture have not met with success, but not infrequently their failure has been directly attributable to their lack of acquaintance with the requirements of the crop, to their inability to procure suitable seed, or to their failure to observe approved methods of culture.

Before entering upon the discussion of this subject it is only fair to state that I have never grown an acre of corn in the province of Saskatchewan. For a number of years I have visited the agricultural colleges and many of the experiment stations in the Prairie Provinces and have observed closely the results of the many experiments being conducted with this crop. My practical experience with corn and its culture has been gained principally in the corn belt of the middle western states and in the provinces of Quebec and of Ontario. In discussing this subject, therefore, I shall confine myself mainly to those principles in corn growing which are of broadest application. To Professor Bracken, of the University of Saskatchewan, and to Mr. W. H. Fairfield, Superintendent of the Experimental Farm at Lethbridge, my thanks are due for the assistance they have given me in my attempt to make the treatment of this subject of the greatest practical value to the farmers of the Prairie Provinces.

Farmers in Western Canada are interested in corn because wherever it can be successfully grown it gives a heavy tonnage of palatable, succulent roughage at a low cost per ton. In live stock districts where the culture of root crops is not general it is becoming increasingly recognized that more attention must be paid to succulent roughages. Corn is one of the most widely adaptable of these and as a result its culture is being rapidly extended.

In consideration of this subject the first essential to demand attention is that of the class of corn best adapted to meet the requirements of a given district. The shorter the season the more important it is that an early-maturing sort be procured. Flint corns are, as a class, earlier maturers than dents. It is among the flints, therefore, that we must look for our earliest ripening corns.

Among the commercial varieties of this class the many-coloured Squaw stands first. Being very early, the yield of stalk and leaf is much less than that of varieties requiring a longer season to reach the glazing stage. The next in order of earliness is the Free Press. Although a little later in maturing, this variety gives, on an average, a somewhat higher yield of fodder than the Squaw. The Jehu produces about the same average tonnage as the Free Press and has proved itself an

ture excellent variety. Next in the list comes Quebec No. 28. This improved strain was isolated at Macdonald College by means of the ear-row method of selection and is now grown to some extent in all the provinces of Canada. Another standard flint corn is the Longfellow. This variety is more cylindrical than any of the others and carries but eight rows of kernels. In common with all eight-rowed corns its kernels are larger than those of the twelve-rowed varieties. Compton's Early is a vigorous-growing, twelve-rowed, yellow dent which is very popular in many districts, but it is too late in maturing for general culture in Saskatchewan.

In districts with longer growing seasons, and with higher temperatures than those required for Quebec No. 28, or Longfellow, the Northwest Yellow Dent or an early maturing strain of White Cap Yellow Dent might advantageously be grown.

In purchasing seed corn the buyer should remember that corn differs from small grains in that, as a rule, the larger the grain the more days will the crop require to mature. The size of the kernel in any given class constitutes a fairly reliable indication as to the length of growing season required.

Seed corn should be purchased in the ear rather than shelled. Ear corn is somewhat higher in price than shelled but almost invariably the quality is better. Most seed corn which is low in vitality has been injured either as a result of freezing or of imperfect storage. In either event evidences of this lack of care are more easily detected before the ears have been shelled than afterwards. Moreover, evidences of breeding or lack of breeding are much more readily determined when the corn is on the cob. The growing practice of demanding seed corn on the ear has done more than any other single factor to ensure a dependable supply of acclimatized seed.

A careful germination test should be made of all corn intended for seed purposes. Such a test not only shows the germinating power of the sample but gives a fairly accurate idea as to its ability to produce strong, vigorous plants.

Corn is a semi-tropical plant. It responds, therefore, to a warm, friable soil, especially one which is fairly retentive of moisture. A soil of this nature should ensure a good return, even in case the rainfall is light, provided there is a fair supply of moisture at the time the corn is planted.

While better yields of wheat and oats have frequently been obtained after corn than after summer-fallow, one would not be justified in concluding that corn will displace the fallow in this province. Where the rainfall is heavy enough to admit of the corn crop being sown on what is now fallowed land, a well-tilled crop may take the place of clean cultivation to a certain extent, but it is doubtful if the practice will ever become general in the drier sections of the prairies.

Your chairman, a few moments ago, referred to the difficulties which confront you in your perennial fight with weeds. In this respect your experience coincides with that of the farmers in the older settled parts of Canada. Their solution of the weed problem lay, not in dispensing with the fallow but in supplementing it with the growing of hoed crops which enabled them to keep the weeds in check and at the same time obtain, from their inter-tilled land, a large return in succulent feed for their live stock.

The preparation for the seedbed will depend upon the soil and upon the kind of weeds present. If the land is overrun with grass it should be ploughed in the fall; if the weeds are neither numerous nor persistent, deep fall cultivation will reduce their numbers very materially and so will lessen the amount of inter-tillage required during the time the crop is growing.

So far as the applying of fertilizers goes, I take it there is but one in which you are interested—yard manure. In parts of the eastern provinces, where the season is short, considerable quantities of superphosphate are used to hasten the maturity of the crop, but it will probably be some time before this practice becomes at all common in the Canadian West.

The grower can rarely be governed by the calendar as to the time for planting corn. Heat and moisture conditions are more important than the date of the month.

The acreage of corn planted too early is generally greater than that put in too late. General experience leads one to the conclusion that, in the normal season, little is gained by planting before the fourth week in May, and in the backward seasons the end of the first week in June is as early as it is wise to put in the principal acreage of this crop.

The rate of planting differs widely. A bushel of twelve-rowed flint will contain more than twice the number of kernels that the same measure will hold of a large dent variety. If the seed, when tested, shows strong germinability, from nine to fifteen pounds per acre should be ample for hill planting, with an increase of from two to three pounds per acre for drill seeding.

Since the farmers of the prairie provinces are not interested in corn primarily for grain, and since a greater tonnage is usually secured from row planting than from hill planting, the probabilities are that the check-row-planter will not become general west of the Great Lakes for some time. Wherever the ridding of the land of weeds is one of the principal objects in growing corn the hill system is especially worthy of consideration, as it not only reduces the amount of hand labour but generally results in a better matured crop.

When corn, whether dent or flint, is planted in rows from thirty-six inches to forty-two inches wide, and when the stalks are thinned to different distances in the row, the heavily planted rows give more tonnage than the lighter ones but the quality is generally somewhat poorer. For example, stalks four inches in the row will yield more green feed per acre than stalks at eight, twelve or sixteen inches; but the best proportion of stalk, leaf and ear is generally obtained when the plants are left with from eight to twelve inches of space between them. Similarly, six stalks to the hill will yield more tonnage than four stalks, but the latter generally grades highest in quality. Small flint corns should be planted thirty-six inches apart each way; large dent varieties will do best at forty-two inches.

After the corn has been planted it should be harrowed two or three times before it attains a height of six inches. This will probably pull out some of the plants but if a tilting harrow is used the loss will be almost negligible. An occasional stroke of the harrow at this stage of the crop's development will tend to maintain a dust mulch, will conserve moisture, and, above all, will rid the field of myriads of small weeds which, at a later date, will otherwise become very troublesome.

When the harrow can no longer be advantageously used the two-horse cultivator should be started. The early cultivations should be wide and deep; the later ones should be narrow and shallow so as not to prune the roots too severely. When the corn has attained too great a height to admit of further use of the two-horse machine a single-horse walking scuffler of the strawberry type can often be used most advantageously, especially in very dry seasons.

When corn is grown for siloing it may be cut and fed as soon as it begins to tassel. When harvested for the silo the kernels should have reached the glazing stage; but if the crop is being grown for dry fodder it should be left standing as long as there is no danger of heavy frosts. The time of cutting, therefore, will be determined wholly by the use to which the crop is to be put.

Where any considerable acreage of corn is grown for feed a silo is a necessity, as only a limited acreage can profitably be grown either for siloing or for fodder. In some districts the practice of growing very early grain corns and "hogging off" the crop is becoming more general, but this is a practice in which corn growers in Canada have had too limited experience to warrant more than a passing reference.

The CHAIRMAN: Our difficulty I think in corn growing in our part of the West is the short season and the cold, or cool, nights.

Prof. FAIRFIELD: We have had irrigated corn on our farm every year except 1915 and also 1916 since the station was started, and that is overcome for this reason. In irrigating corn or any other crop we never irrigate it until the crop requires it.



We never apply water until the soil is dry enough and the crop really requires it, so that the irrigation of corn comes in the latter part of July and August when the ground is pretty hot and during the middle of the day the leaves draw up. Just the time the farmer would say, when looking at his corn crop, "My, if we could get a rain it would help," and that is the time we apply the moisture. We would not, however, irrigate the corn in June when the ground is not very warm.

The CHAIRMAN: I will now call upon Mr. E. H. Finlayson, Inspector of Forest Reserves, who will address us on "The Cypress Hills Forest Reserve."

MR. FINLAYSON: The first definite action taken towards the establishment of a forest reserve in the Cypress Hills region was in 1906, when a small tract comprising eighteen square miles, lying west of the 4th Meridian, in Alberta, was set aside as a forest reservation. In 1911 the reserve was considerably extended some sixty-three square miles in Alberta and seventy-two square miles in Saskatchewan being added; this brought the total area in 1911 to 153 square miles. Subsequently, further examinations were made and in 1914 another twenty-five and one-half square miles were added, bringing the total area to 178.5 square miles—the area of the reserve at the present time. The Forest Reserve does not of course, include all of that territory which is familiarly known as the "Cypress Hills", but, as will be seen from the map, it is laid out in three separate blocks, including only such country as lies at the higher elevations and which is not well suited to the cultivation of farm crops.

The Reserve consists of a series of relatively high plateaus, these being deeply cut across in various directions by the numerous important streams which have their source in the hills. Between Medicine Hat and the summit of the hills some thirty-five miles southeast there is a difference in elevation of approximately 2,600 feet; in other words, the summit of the Cypress hills is higher above the city of Medicine Hat than the latter is above sea-level—some 400 feet higher. The difference in elevation between the town of Maple Creek and the summit of the hills to the south, however, is not so great, being some 1,700 or 1,800 feet.

Speaking of elevations it may possibly be of interest to some of you to hear that the average elevation of the hay benches in the Cypress hills is somewhat higher than the eastern boundary of the Rocky Mountains Forest Reserve. I think it is more than likely that most of those present have, at one time or another, travelled through the hills, and consequently it is unnecessary for me to describe them in detail; suffice it to say that as one travels southward from the main line of the Canadian Pacific railway the country rises very perceptibly till, on approaching the hills, somewhat rugged slopes are encountered. It is somewhat of a surprise on reaching the summit to look for miles in several directions over what appears to be almost dead-level hay-bench. To the south the hills slope away more gently. Rising in these hills are numerous streams of particular interest to those present. In the Western Block, Battle creek with its tributary Grayburn creek, Lodge creek, and Ross creek have their headwaters, some draining north but the bulk of the water draining south and east; the Centre Block gives rise to Belanger, Lone Pine, Sucker, Fish and Maple creeks; finally, in the Eastern Block there rise Davies, Fairwell, Sheep, Hay, Piapot and Bear creeks—the first two running southward eventually to reach the gulf of Mexico, the others draining north and having their eventual outlet Hudson's bay.

Formerly many parts of the Reserve bore a very fair stand of merchantable timber, but unfortunately the very extensive fire of 1886 practically wiped out the bulk of this timber in some areas, while in other places fires of subsequent date destroyed the balance of the original stand of merchantable timber. In speaking of "merchantable timber," I refer, of course, to timber of sufficient size for saw-mill purposes. To-day there remain only a few isolated patches of large timber, practically all in the

Western Block. It is true that a fair-sized block of timber to the south of Elkwater lake escaped the fire of 1886; this, however, was included in a timber berth and, not only was the bulk of it removed by logging operations, but the logging slash which resulted therefrom constitutes about the worst fire menace which we have anywhere in the reserve. It was a most fortunate circumstance that one of the constituent trees of the original stand of timber, namely, lodgepole pine, has rather a marvelous capacity for reproducing itself; this is due to the fact that the species is a prolific seeder, and that the seed-bearing cones are so hard and compact that oftentimes they take almost the heat of a fire to break them open so that the seed may be shed. To these characteristics of the species is due the fact that over very extensive areas we have a remarkably good reproduction of lodgepole pine. The tree itself, however, is exceedingly susceptible to fire, the bark being comparatively thin and scaly, and as well as other portions of the tree, is decidedly resinous and inflammable. Notwithstanding its reproductive qualities, therefore, with repeated fires the species may soon be practically exterminated; that is, if fire destroys the pine stand in its younger stages, before the trees are capable of bearing seed, we can hardly expect the species to maintain itself. Lodgepole pine, it may be said, is almost distinctively a mountain tree, and so far as we know the Cypress hills is the only place where it ventures so far eastward.

White spruce also was an important constituent of the original stand, occupying the moisture situations, and consequently escaping the fire in rather isolated patches. In some places it is reproducing itself in a rather limited extent. The only other important kinds of timber to be found are the poplar (two species) and the willow (several species); a small amount of birch is to be found in some parts, and, though I have not seen it, one of our officers has reported a limited amount of wild cherry. Manitoba maple and kindred species in the eastern part of the reserve.

As to distribution of timber in the reserve, the Western Block is approximately 70 per cent timbered, of which perhaps the bulk is pine and spruce, the balance poplar and willow. The Centre Block is approximately 40 per cent timbered, about one-half pine and spruce, one-third poplar, and the balance willow; the main body of timber in this block is about 30 years old and has an average diameter, breast high, of from 6 to 7 inches. The Eastern Block is approximately 75 per cent timbered, but there is but little pine or spruce; poplar, willow and other species having taken predominance, probably as a result of repeated fires in the early days. That such a large area of the reserve (about one-third) is entirely devoid of tree growth can not be solely and legitimately attributed to fires, at least not to fires of recent times. There are many areas, notably the hay benches, where we have no conclusive evidence that timber growth has existed in modern times. That at least certain portions of the hay benches are capable of bearing tree growth, however, is evidenced by the presence in isolated patches, or as individuals, of small stunted pine growth, in spite of the remarkable growth of grasses which are inimical to tree growth.

The whole reserve is in charge of a forest supervisor, Mr. F. D. Brown. He has a permanent staff of three forest rangers and one general utility man. The Western Block is divided into two ranger districts, the ranger in charge of the westerly district having his headquarters three miles south of Elkwater lake, while the second ranger has his station on Battle creek near the reserve headquarters. The third ranger district embraces the Centre and Eastern blocks of the reserve, the ranger having his headquarters in the northern part of the Eastern block on Birch creek.

The general headquarters of the Reserve is located on Battle creek close to the point where it crosses the southern boundary of the Reserve. At this place the supervisor has his residence and office. Under the direction of the supervisor the rangers perform the function of fire patrol and protection. They conduct the timber and hay administration and all other duties which arise in their respective districts. To facilitate the administration material improvements are rapidly being provided. In the time during which the Reserve has been under definite supervision, almost exactly

three years, there have been constructed a supervisor's house and office, three ranger houses, four fine barns, two outlying ranger cabins and stables, twenty miles of telephone line, considerable road improvements, and many miles of fire guard and boundary lines and other improvements. Such items, however, are merely preliminaries to the proper development of the Reserve. Much work lies ahead which may be of more direct benefit to the water users of the Cypress Hills region. I think every one will grant, however, that facilities must first be provided wherewith to solve the problems of fire protection, ere it is feasible and safe to initiate work of a more technical character, namely, the improvement and re-establishment of the forest cover.

The two primary factors entering into the establishment of the Reserve were, (1) the maintenance of timber supply, and (2) protection of the watershed. With the latter of these I presume you are particularly interested, but let me first say something with regard to timber utilization. With the exception of the Cypress hills practically the entire country for many miles in every direction is almost or entirely devoid of tree growth. Very fortunately there are extensive areas of lignite coal and, on a general proposition, the fuel situation is not so serious as would otherwise be the case; nevertheless there are many who still must depend to a certain extent on wood for fuel purposes. Even in the production of coal, wood is necessary. For other purposes, also, such as lumber, fence posts and rails, poles, ties and rough construction timber, the forest must still continue to supply the wants of man. Notwithstanding the development of many substitutes for wood, statistics do not show that the per capita consumption of wood has materially decreased; indeed, in many parts it has appreciably increased. As this state of affairs will probably continue for many many years, it is essential that we should consider carefully the question of our supply. Taking the area of the Cypress hills which at present is under forest cover of one kind or another, and without even attempting to re-stock the open areas, using the most conservative figures the Cypress hills is capable under proper forest management of producing from six to seven million feet board measure per year; at average rates of consumption this is sufficient to supply the annual requirements of some 18,000 people. At the present time the Reserve is supplying a certain local demand for various classes of wood products, but to bring it to a state where it will take its proper place in supplying demand will take years of painstaking effort and intensive application of the principles of forestry. If we could have the Cypress hills as they probably were forty or fifty years ago, it might only be necessary to put in effect a well regulated system of cutting. Taking it as it stands to-day it is necessary that we confine cutting operations to such classes of timber as may well be spared without detriment to the forest cover; to securing as complete utilization as possible of all dead and inferior material now present; to formulating and putting into effect plans for re-stocking by artificial means such areas for which we cannot depend on natural regeneration. Situated as it is, in the heart of a country practically devoid of tree growth; offering as it does, the most advantageous conditions for forest practice; and important as the maintenance of the forest is with relation to the watershed, the Cypress hills offer the most unique and favourable set of conditions for scientific forest practice in the prairie provinces at least, if not, in the whole Dominion of Canada.

Coming now to the protection of the watershed, it is generally recognized that forests offer very decided influences to both local and general climatic conditions. It cannot be claimed that a small forest can exert any decided influence over climatic conditions of a large area, notwithstanding the fact that it does have a decided influence upon climate within the forest itself; rather it is claimed that if the proportion of forested areas in a country is in proper relation to the area of the whole, the effect of the forest on climate is generally and favourably appreciated. The effects of forests on climate may be summarized as follows:—

(a) The forest lowers the temperature of the air inside and above it. The vertical influence of forests upon temperature extends in some cases to a height of 5,000 feet.



(b) The forest lowers the temperature of the soil in summer and increases temperature of the soil in winter. This influence extends to a depth of at least a few feet.

(c) The relative humidity of the air during the summer is higher in the forest than in the open.

(d) Forests increase both the abundance and frequency of local precipitation over the areas they occupy, the excess of precipitation as compared with that of adjoining unforested areas amounting in some cases to more than twenty-five per cent. This is due to the tendency of moisture-bearing currents to precipitate their moisture more readily above or near the forests than over bare or cultivated fields at the same elevation because of the dampening and chilling effect of the forests upon the atmosphere, which induces a greater condensation of the water vapour. Also, the air in the forests contains a much larger amount of moisture than that over bare or cultivated fields. These effects on local precipitation are more evident in very hilly and mountainous country.

(e) The presence of forest cover decreases to a very marked extent the evaporation from the earth's surface, due not only to interception of the sun's rays, but also to the greater humidity of the forest.

Inasmuch as the area of the Cypress Hills Reserve is very small as compared with the extensive open areas surrounding the hills I do not pretend to claim that restoration of the forest cover to normal is going to have any decisive or general effect on the climate of the surrounding country. Its local effect, however, even if confined to the reserve area itself, is of importance in connection with the regulation of stream flow. In hilly and mountainous country the forests are conservers of water for stream-flow. Even on the steeper slopes they create conditions with regard to surface run-off such as to obtain in a level country. Irrespective of species, they save a greater amount of precipitation for stream-flow than does any other vegetable cover similarly situated. They increase underground seepage of water to a larger extent than does any other vegetable cover. The steeper the slope, the less permeable the soil, and the heavier the precipitation the greater its effect. The forests break the violence of rain, retard the melting of snow, increase the absorptive capacity of the soil cover, prevent erosion, check surface run-off in general, thus increasing the underground seepage and so tend to maintain a steady flow of water in streams.

In the hills and mountains the greatest source of loss of precipitation is through surface run-off, and the most important influence which a forest cover has is in reducing this. In general it may be stated that the amount of water which the forest cover saves to the soil by reducing the surface run-off and changing it to underground seepage is as follows: For forests at low altitudes where the rains are not heavy and the soil is less subject to freezing, twenty per cent; for forests of moderate altitudes, thirty-five per cent, and for mountain forests fifty per cent of the precipitation. The saving of precipitation effected in this way by the forest is more than sufficient to offset whatever loss may be sustained through transpiration or interception by tree crowns. This is clearly brought out by the following facts: The entire loss of water from forested areas at moderate altitudes, even on the steepest slopes, is about equal to that from forest in level country. New places this at sixty-one and one-half per cent of the precipitation. Cultivated fields on similar slopes have been computed to lose through interception by vegetable cover, evaporation from the soil, transpiration, and surface run-off, seventy-nine per cent of the precipitation, and bare surfaces eighty-six and two-fifths per cent. The higher the altitude, the steeper the slope, the heavier the rainfall, and the greater the precipitation, the more marked will be the difference.

That a normal forest in the mountains saves more water for stream-flow than any other vegetable cover or any bare surface is shown also by the abundance of spring in mountain forests. Reduction of surface run-off means both an increase of under

found seepage and prevention of erosion, two important factors in the regulation of stream-flow. The action of mountain forests in protecting the soil against erosion and increasing underground seepage at the expense of surface run-off is the result of their ability to lessen the severity of rainfall, to retard the melting of snow, to offer mechanical obstacles to surface run-off, to hold the soil together, to keep it in a permeable state, to increase its volume by constantly adding new soil, and to absorb large quantities of water by its leaf litter.

In glancing over the report of one of your previous conventions the other day, I noticed resolutions passed by the Cypress Hills water users urging the formulation of plans for establishing artificial reservoirs in order that the water supply might be conserved and regulated. These may undoubtedly be necessary, but I would also point out that the evaporation from a free water surface outside a forest is greater than from a free water surface within a forest; also, the forest itself, aside from the natural bodies of open water which it may enclose, acts as a great reservoir, regulating stream-flow and preventing erosion and floods, which, entirely aside from the water loss they involve, have a mechanical effect in causing destruction not only to ordinary lands and property, but also in some cases to the very works designed to conserve and use the water. If, as a result of the few explanations I have given of our work from a forestry standpoint, and the few general remarks with regard to the relation of that work to your interests, you can induce governments and the people to see the necessity of maintaining and improving the forest conditions in the Cypress Hills, I can only say that if our interests are not precisely mutual, they are at least very closely allied, and both from the standpoint of timber supply and water supply every one will benefit greatly by measures which may be taken as a result of our endeavours. Just as we who are in forestry work may say "fire is our great enemy," you who are engaged in irrigation work may say "floods are our enemy." Reducing fire danger improves the forest and does at least something to reduce floods; conversely, reducing floods, that is surface run-off, does much to reduce fire danger. Therefore, let us each pursue our own ends and we cannot do otherwise than help each other. (Applause.)

The CHAIRMAN: I am sure that you have appreciated the paper to which you have just listened, because the recent fires in Alberta bring home to us the fact that we should take more interest in reforestation.

Mr. MARNOCH: Mr. Finlayson establishes a connection between this forest reserve and irrigation. It affects the people of the Cypress hills more than it does the people in Alberta, but generally speaking Mr. Finlayson puts his statement this way: that the Cypress Hills forest reserve is a sponge, if only used properly. We are told that there are 475 water users in that district, and Mr. Finlayson states that if the matter of reforestation is attended to, the matter of water will be greatly improved. I think a motion should be made by this association to the Dominion Government. The other matter of the output of some six to seven million feet of lumber is of great interest. When you get in addition to that a new and valuable asset which will have the effect of increasing the effectiveness of that sponge, I think that this association should do something in the way of a resolution to the Dominion Government asking them to do something in the way of reforestation.

## THURSDAY EVENING SESSION—AUGUST 2.

The CHAIRMAN: I would ask Mr. G. R. Marnoch, President of the Board of Trade, Lethbridge, to speak on "More and Better Water for our Farms."

MR. MARNOCH: May be this subject is not a matter of prime importance to irrigation farmers, because the water that is brought to the farm by the canals is all right for stock purposes, and if it can be stored in cisterns and filtered and purified for domestic use, and if the irrigation farmer has a preference for getting his domestic water by means of a well, so that the supply is already filtered by percolation from the canals and through the soil, he usually has no difficulty in getting such well water at easy depths; so the irrigation farmer is comfortable in this respect. But there are very few farmers through southern Alberta and southern Saskatchewan who would not feel very much easier in their minds, and their bodies too, if they had more water for house and farm use; and there are very large numbers of farmers and people in towns and villages who would be very happy indeed if they could get any well water.

When we first started in Lethbridge in 1914 to look into this matter on behalf of some of our farmer neighbours, the so-called oil boom was on in Alberta. In looking over some of the valuable publications of the United States Geological Survey on this subject we came across the information that the government geologists in the United States made it a regular part of their business to prospect for water supplies. Up till that time, however, nothing had been done in that direction in Western Canada. We seemed to prefer to use the hit or miss method, or at best to trust ourselves to the tender mercies of the water witch or the divining machines. The folks who attended the Water Conference in Lethbridge on the 22nd of June this year did not take very long to make up their minds that some surer methods than these should be followed if we were to make much progress. Upon information that we had received from the United States Geological Survey and other sources, we had come to the conclusion long before; at any rate, we thought we ought to call for help from our own government geologists. That was readily given as soon as it was asked for, and in the summer of 1915 Mr. D. B. Dowling and Mr. Slipper spent several months surveying the rock and shale exposures, and examining the logs of such deep wells as were available in the districts south and east of Lethbridge. They came in at the end of the season with the valuable information that some three to five hundred square miles of that territory was underlaid by a sandstone carrying water seepage from the Milk river in the south and that it could likely be got by boring to six or eight hundred feet depths, which would bring in flowing wells. The next thing, however, was that as far as our knowledge went it would cost four or five thousand dollars to get a six-inch well down that far, and as no farmer would even think of such an expenditure unless we were as nearly as possible certain that he would get the water, we thought the Dominion Government should do something to confirm the valuable information that the geologists had produced. We, therefore, asked the Government to help out. In due and decent course of time it was arranged that one or two test holes should be put down in public road allowances in parts of the district where such wells had not previously been drilled. One of these, about ten miles north of Legan, on the Lethbridge-Manyberries line, has been successfully completed, and it has a flow of 4,000 gallons a day from a depth of 633 feet. With the artesian wells that had been previously sunk at Etzikom, Coulee, Foremost, Grass Lake, Taber, and Neidpath, the field has now been fairly well proven. The Canadian Pacific Railway is drilling another artesian well at Conrad, and the Government will go on with two more wells, and the results of these borings will add further to our knowledge.



All of this, however, leaves a big problem still unsolved, namely, is there any possible way of getting down to the artesian water with a smaller hole which would give a good supply for the average farm at a smaller outlay than four or five thousand dollars; what means can be taken to get water supplies at lower depths, and especially in the regions outside of the artesian area; what can be done by diverting waters from streams, and how best can water be saved in coulees and depressions; can any cheap means be found for prospecting for water by a quick method of drilling small holes to look under the ground, as it were, for water, before going to the expense of digging or drilling; and last, but not least, are we doing our best to take care of the rain water that falls on the roofs of our buildings.

To see what daylight was available on all these important questions we decided to summon a conference at Lethbridge a few weeks ago. The farmers came in in large numbers, and the great need that they are in was amply shown by one man, who said he would gladly mortgage his homestead to any one who would find water on it. He had spent hundreds of dollars in drilling dry holes. He, and many others equally anxious for water supplies, were able to confer with the government geologists, the irrigation engineers, and health officers, and the railroad engineers, who have big problems themselves in quenching the burning thirst of their big locomotives. Every one threw his knowledge and experience into the common pot. A vice-president of the United Farmers of Alberta and one of their directors were present. The Deputy Ministers of Agriculture and of Public Works for the province of Alberta were there too. The finest spirit of co-operation was in evidence throughout the meeting. The geologists and engineers were quite delighted to meet the farmers and to put the whole of their knowledge and experience at their disposal.

Some useful knowledge was contributed by one or two of the farmers, who said they had been able to trace out limited supplies of surface water by certain plant growths. This is being looked into now by some of the government officials.

In the later stages of the conference there was some discussion as to the need for more extended attention to the subject of education in rural engineering. This subject affects all classes of farmers, and it would be well if our farm boys could get useful direction in elementary engineering work, such as the principles of good road-making, building dams, and laying out irrigation canals and drainage ditches.

We also heard from Mr. F. H. Peters, who has been making practical tests of a water still that he has designed for use on farms. Dr. Seymour, Commissioner of Public Health, Saskatchewan, addressed the conference on the saving of rain water, filtering water, and generally on plumbing and sanitation for the farm home.

We are proceeding now with the gathering together and printing of as much as possible of the information brought out at the conference, and we hope to have a little booklet on the subject ready in course of a week or two.

Here are the resolutions that were passed. They give in concise form the results of the discussion:—

"That this conference respectfully requests that full inquiry be made by the Department of the Interior of the Dominion of Canada into the important question of reservations along the rivers, lakes and coulee fronts for sanctuary for live stock in time of drought in the drier areas in southern Alberta and southern Saskatchewan, with a view to making such reservations.

"Further that, following upon and during this inquiry the Alberta and Saskatchewan Provincial Governments collaborate with the Dominion to the end that practicable road approaches may be provided for reaching those reserves; and further that, the Government take steps to reserve a strip along all water fronts."

"Resolved, that this conference respectfully requests the Dominion Government Department of the Interior, to make inquiry with a view to supplying a living stream of water from Milk river via the Alberta Railway and Irrigation canals, via Stirling and Etzikom coulees and Pakowki lake, with a view to

constructing such works as may be necessary to supply such water for the increasing needs of the farming communities of southern Alberta.

That in the opinion of this conference there should be established at the University of Alberta a department of agricultural engineering to give B.S.A. graduates and others interested a course in this work, and to undertake such research work as shall be of service to the farmers of Alberta in matters pertaining to roadmaking, irrigation and drainage."

"In view of the information given at this conference that the Irrigation Branch of the Department of the Interior have a Calyx boring machine which could be used for rapidly and cheaply drilling test holes for the discovery of water. Resolved that this conference respectfully requests the Alberta Government to secure the use of this machine for discovery tests, first, in the area south of Coalhurst and west of Lethbridge, and if it is found satisfactory in practice for this purpose, that the Alberta Government purchase several of these machines for use in testing for water in depths up to 100 feet.

"Resolved that this conference urges on both the Dominion and Provincial Governments the desirability of obtaining a full and complete log of all wells dug or drilled whether for water, gas or oil in Canada. That such information is absolutely necessary having in view location of further wells;

"That analysis of water so obtained in such wells be recorded for purpose of ascertaining if such be potable or suitable for stock watering purposes;

"That if in order to obtain such laws legislation be necessary, that the same be passed; also that regulations be passed to prevent waste of water from flowing water wells and gas and oil wells."

We are receiving inquiries every day from farmers as to what practical results have come from the water conference. Well, as soon as the conference was over copies of the resolutions were sent on to the Minister of the Interior at Ottawa, and to the Minister of Public Works and the Minister of Agriculture at Edmonton.

There can be no doubt that the closest co-operation will be extended by the Department of the Interior. Hon. Dr. Roche writes that, "the matters referring to the Interior Department will be given every consideration, as we desire to do what we can to meet the wishes of our settlers in every reasonable manner consistent with economy during war time."

Hon. Chas. Stewart writes from Edmonton:—

"Anything that we can do to open up road allowances to water reservations will be cheerfully done by us." A formal acknowledgment of receipt of the resolutions has also been received from the Public Works Department at Edmonton.

One of the things that is being taken up at once is the getting into use of the small boring machine for testing out for surface waters over south of Coalhurst and Kipp. We wired to Hon. Chas. Stewart: "Referring to resolution of water conference, farmers are anxious to learn what is being done to secure the small boring machine from the Irrigation Branch at Calgary and set it to work prospecting. Should be no difficulty getting machine. Minister of Interior writes indicating fullest co-operation." And we learn from Mr. Charlesworth, the Deputy Minister, that he is in communication with the Commissioner of Irrigation on this matter.

With regard to the watering reservations for live stock, it will likely take some time to have this thoroughly looked into; but there are many cases now where farmers are blocked from easy access to river waters. Such farmers can now take these matters up direct with the Public Works Department, on Hon. Mr. Stewart's assurance that road allowances to water will be opened. Farmers can do this individually or through their local organizations.

We are advised that Hon. Dr. Roche is giving his personal attention to the important subject of stock watering reservations.

Owing to his duties on the Grain Control Board, Mr. H. W. Wood, President of the United Farmers of Alberta, was unable to attend the conference, but the Board of Directors of the United Farmers of Alberta have placed their official seal of approval on the actions of the conference by the following resolution:—

“Resolved:—

“1. That we endorse the action of the Lethbridge Board of Trade in calling the Water Conference recently held in that city.

“2. That we believe the questions there considered are of vital interest to the farmers generally.

“3. That we are in harmony with the general principle of the resolutions there passed.

“4. That we favour the publication and distribution of the proceedings of the conference at Government expense.”

While it is necessary to lean back on the governments on some of these matters, it is just as well to confess that many farm buildings are not provided with eave-troughs, barrels and cisterns. This neglect is criminal. The weather clerk lays the water on the roof, and if you only give him a little bit of pipe he will put the finest, softest rain water right into the barrel or down in the cistern for you. A farmer's wife says to me the other day, “Yes, *he* has been talking of putting up eave-troughs and setting up a barrel or making a cistern for the last four or five years,” and the way she said it seemed to indicate that if she waited four or five years longer *he* might get round to it. In one of the new towns along the Manyberries line only two buildings out of about two hundred have eave-troughs, yet the people pay sixty cents a barrel for water from a slough. I find it necessary to mention such things as this to farmers who complain about the painfully slow actions of the governments. I almost think the water conference should have passed a resolution requiring every farmer to do what his wife told him to do in regard to getting domestic water, and to do it at once; only even at that I have discovered that resolutions need to be followed up, and if the farmer's wife cannot do that, it is hard to know who could do it better. I mentioned this matter the other day at a gathering of farmers and their families who had come to spend the day at the Dominion Experimental Farm to imbibe some of Mr. W. H. Fairfield's wisdom about irrigation farming and dry farming. Some one had been talking to them about planting trees, and I told them that many promises had been made to plant trees around our country schoolhouses and it was necessary to remark that trees grew better on summer-fallow land than on promises. A farmer's wife came up to me afterwards and said, “You should not be discouraged about the trees, and the women should not be impatient about the rain water. I got eave-troughs and a cistern this year after fifteen years' agitation.”

Away back in 1914 at a meeting in Regina we discussed water for the farms for a while. I quoted the verse from an Old Country song:—

“A little farm well tilled  
A little house well filled  
A little wife well willed,  
Give me, give me.”

and our friend Dr. Rutherford improved on these poetic lines by adding another,—

“A little well well drilled.”

So while it has taken us three years of patient endeavour to get even this far on the question of more and better water for the farmer, we may take heart of grace from the experience of this farmer's wife, and we will keep on investigating, resolving, boring, drilling, digging and damming till every farmer gets all the water he wants for his beloved live stock, and until every farmer's wife gets at least enough water for the weekly wash delivered inside the house at the kitchen tap.



During the water conference I read this quotation from a little booklet called "Farm Efficiency" which contains about as much common sense in small bulk as I have ever seen. The booklet is by Xenophon Caverne of the Kewanee Public Utility Company, of Kewanee, Illinois. "President Joe Cook, of the Mississippi Normal College, in a bulletin of the United States Bureau of Education, makes the rather startling statement that the average farmer's wife has to lift a ton of water a day. Here is how he figures it out:—

The getting of the water from the source of supply to the point of application requires more manual labour than any other item of housekeeping. The water for the kitchen has to be lifted from the well, carried to the kitchen, poured into the kettle; poured out of the kettle into the dishpan, and from the dishpan out of the dishpan into the kettle. This makes six times the water is handled, and a bucket of water containing two gallons, with the containing vessel, will weigh twenty pounds. When this is handled six times the total lifting is 120 pounds. The cooking of three meals a day on a meagre allowance of water will necessitate ten buckets, which will make for cooking alone, 1,200 pounds of lifting per day. When to this is added the water necessary for bathing, scrubbing and the weekly wash, it will easily bring the lift per day up to a ton; and the lifting of a ton a day will take the elasticity out of a woman's step, bloom out of her cheek, and the enjoyment from her soul."

Imagine an average farm home without modern improvements and conveniences. Picture to yourself an average farmer's wife as she goes through her daily routine. Follow every step from the time she starts the fire in the frigid kitchen till she lies down wearily down the last pair of mended stockings at night. Now by magic, transfer her in her sleep into a house with just the plain conveniences; a heating system; running water; hot and cold; a bathroom with lavatory, closet and bath tub; a sanitary system of sewage disposal; a power plant that not only pumps the water, but runs an electric light plant with storage batteries; a power washing machine and wringer, a power separator and churn, a vacuum cleaner, and perhaps an electric flatiron and a little motor to run the sewing machine.

Give her an extra hour to sleep. The kitchen is warm, the water is hot, and she can get breakfast in a jiffy on the oil stove. Now picture to yourself her day's work and her day's uplift to body, mind and soul. It is the difference between losing and winning, between conquering and being conquered. Look at these pictures from the standpoint of efficiency, of humanity and of romance. No magic of Aladdin's lamp could work a greater transformation or bring greater joy and comfort.

And what would be the cost? The wages of a hired girl or two weeks of a nurse and doctor would much more than carry the interest on the investment; so would the price of a fair cow or a poor horse. A long spell of sickness and a first-class funeral would buy the whole plant." (Applause.)

CHAIRMAN: I do not think Mr. Marnoch needs to say anything about the timeliness of his paper. There are hundreds of farmers around the country trying to do something to relieve the drudgery of the household tasks. We often speak of the weak link in the agricultural chain as being farm power but the weak link is in most cases the water.

I have come from a brief visit to Banff. I think it was occasioned by the hard work and neglect of myself in my earlier days. I found that the hotels there are filled with wornout farmers and their wives from the Prairie Provinces. Instead of laying up early for repairs, they go on for forty or fifty years before they do lay up. We would not use our binder or threshing machine that way. Every man repairs his machine about this time in order that his threshing machine will not break down during threshing. We should do the same with ourselves. After all, human life is more valuable than anything else on the farm. The most expensive and extravagant way of doing your farm work is at the expense of your wife's health. There is scarcely a place that

I know of in these western provinces where something cannot be done to help out in the matter of water supply. Of course, the man who is without cavedroughs on his own farm buildings should not shout for help from the Government until he does have them. If you just sit down without water and wait for the Government to come along with it, the Government will not be in much of a hurry to do anything.

Mr. DIXON: Why do they bore such a large hole?

Mr. MARNOCH: The point is to dig to find out if water is there. If he wants an ample supply and if he wants to get a reasonable quantity he must start out with a bigger hole to get down to a big depth.

Mr. DIXON: At Medicine Hat we use a much smaller hole in boring for gas and we go 800 feet.

Mr. PEARCE: That is because you know the strata.

Mr. POTTER: I would suggest that the resolution adopted at the Lethbridge Conference be adopted by this association.

The CHAIRMAN: It is the wish of the convention to hand those resolutions to the Resolution Committee.

The CHAIRMAN: I will now call upon Mr. A. S. Dawson, Chief Engineer, Department of Natural Resources, Canadian Pacific Railway, to make a report upon his visit to the International Irrigation Congress held at El Paso last October.

Mr. DAWSON: The International Irrigation Congress was held in El Paso, Texas, on October 14 to 19 last. I attended it in company with Mr. R. J. C. Stead, your acting secretary; Mr. R. S. Stockton, of the Department of Natural Resources, Canadian Pacific Railway; and Mr. S. G. Porter, of the Irrigation Branch of the Department of the Interior, Calgary, as delegates representing this organization, the city of Calgary, the Canadian Pacific Railway Company, and the Canadian Society of Civil Engineers. We were given a hearty welcome and placed on the programme. Lt.-Col. Dennis, one of the prime movers in this association, was again chosen first vice-president, and I was elected on the Board of Control.

The congress was a success in every way, and was attended by over 400 accredited delegates. It was not as large in point of numbers as in some previous years, owing principally to the long journey in reaching El Paso, which as most of you know, is on the Mexican boundary.

However, this gave an opportunity to the delegates to see conditions different from those obtaining in any other part of America.

After the sessions were over at El Paso, the congress adjourned to attend the function of the opening ceremonies in connection with the Elephant Butte dam, recently built by the United States Reclamation Service, near Engle, New Mexico.

Although there are not many engineers present here, it will be of interest to you to know a few facts regarding this great structure. It is the third highest dam in the world, with a maximum height of 306 feet and a length of 1,311 feet. In construction it consists of Cyclopean concrete, with the up-and-down stream faces cast against forms. It contains 605,200 cubic yards of masonry and creates the second largest artificial reservoir in the world, with a capacity of 2,640,000 acre-feet. The structure is indeed a monument to the engineers of the United States Reclamation Service.

The International Irrigation Congress, as you know, has grown to be a large organization, costing from \$7,000 to \$10,000 a year to carry on. It was expected to have held the sessions this year at Ogden, Utah, but existing conditions forced the governing body to postpone it for 1917 at least.

I think you will agree with me that it is most desirable to have close affiliation between our association and the larger and older similar association in the United States. The same problems are being worked out in both countries, in efforts to get better farms and better farmers as well as improved living and social conditions, both are engaged in the same great problems of colonization, home building, and development of agriculture along the best possible lines.

Most great movements have been started in a small way, and this applies to the Western Canada Irrigation Association. This association, as you are aware, was created by a small group of energetic men in Calgary in 1907, and I think we should feel satisfied with our growth.

In 1912 we had 165 accredited delegates at Kelowna.

In 1913 we had 132 accredited delegates at Lethbridge.

In 1914 we had 176 accredited delegates at Penticton.

In 1915 we had 200 accredited delegates at Bassano.

In 1916 we had 150 accredited delegates at Kamloops.

This year we have 158 accredited delegates at Maple Creek.

I would urge you all to be optimistic and enthusiastic about the future; remembering that there is strength in numbers; and that it is each one's duty to do the very best for the association, not for personal reasons, but for the good of a cause and playing a more and more important part in the development of very large sections of Western Canada. (Applause.)

The CHAIRMAN: As you will note from Mr. Dawson's report, the International Irrigation Congress was held at El Paso; the same place where the last dry farming congress was held. Now, I think that is very proper because those two congresses should run together. It has been suggested that for efficiency and economy the executives of the irrigation and dry farming congresses should come together. I have come to see that during the past thirty years I have been more or less of an irrigator in my farm operations. Any man who endeavours to hold the run-off on his farm is an irrigator. The man who draws brush into his field or garden in winter or in late fall in order to hold the snow is an irrigator. I think the idea of merging the two congresses into one is a very good one.

I have been waited upon by a deputation representing the association asking me to pledge the Government of Saskatchewan to continue the grant annual. In so far as it is possible for one member of a government to pledge his government I will pledge myself to do all I can to continue the grant given by the province of Saskatchewan to further the work of the Western Canada Irrigation Association.

If legislation is required in connection with the building and allocation of the cost of reservoirs for irrigation districts in the province, I will be only too pleased to get in touch with the executive officers in Saskatchewan to draft the proper legislation just as soon as conditions warrant it.

We know pretty well now without even consulting the newspapers what the harvest is going to be this year. There is no use regretting the drought. The very fact that we are irrigators shows that we anticipated it. The crops of 1914 and 1915 were so large that they were enough to make two or three crops in this country. We must however, always be prepared for drought. A great many people, when they get a few wet years, forget that there may be such things as dry years. I believe in preparing for the worst and hoping for the best.

I regret very much that the last two years have been just what some of us feared and the farmers neglected their tillage. There is absolutely no use in depending upon cloud moisture. It is no wonder that people in the old days claimed that this was an arid district. If you attempt to farm and crop every year off the same field you will assuredly fail. If you adopt irrigation or dry farming methods you could beat out any drought that has come into this district during the past half century.



Those of us who are here know the effect of the drought. We know that in 1914 after that dry year the farmers just buckled on their armour and used the little oats they had to feed their horses and got a lot of ploughing done, with the result that the next year gave us the most phenomenal crop yield we ever had. We know now that the crop will be light and that a large amount of harvest labour will not be required. But to you who can afford it I would say, do not skimp on your harvest labour, use it to get your land into such shape that the crop next year may be greatly improved. During the last two years big crops and good prices have lessened the strain on behalf of the individual more than it has on the collective whole which includes our Allies at the front.

The very fact that you are assembled here to-day for a main purpose should enlist the services of every patriotic man in the country. I have seldom if ever exceeded the enjoyment I have received from this meeting. One thing that has given me great pleasure at this convention is the absolute lack of friction exhibited between the federal and provincial officers of their respective governments who have so well attended this convention.

I remember the first time I went to the Dry Farming Congress at Billings and the succeeding congresses; they would not be open ten minutes before you would note every federal or state official. They were waiting to get in a lick at the other fellow and those of us who came from the other provinces thought a lot of time was wasted in bickering about their respective official duties. I defy any one to find or distinguish between a federal or provincial officer at this convention. Now, I believe Mr. Finlayson desires to say a few words.

Mr. FINLAYSON: This morning I was speaking about the Cypress Hills Forest Reserve. I mentioned the question of fire protection which has been given some attention. Now I thought I would say something about this subject inasmuch as forestry work is closely allied with irrigation and it may not be out of place to say a few words now with regard to that. The Forestry Branch of the Department of the Interior is doing much to bring the Forestry Branch before the people of Canada. They are advertising in different ways to bring before the people the importance of this branch. I have some blotting paper with me which is really the first article manufactured from Forestry Branch products, and I have also some whetstones that will be handed out to-night to the delegates. If you have not any intention of going into the forest yourself perhaps you may have a boy or girl who is going into the woods, and just as you press upon them that there are ten commandments to be obeyed, you should impress upon them one which Moses probably omitted and that is, do not allow fire in the forest.

The CHAIRMAN: On the representations of the Dominion Forestry Association, the Provincial Government of Saskatchewan passed a new Prairie and Bush Fire Ordinance which was greatly along the lines of the Forestry Association ideas and met with their approval.

I have been asked to suggest as a nominating committee which will make nominations for the new executive, Messrs. John Dixon, William Pearce, J. L. Brown.

Mr. PEARCE: I desire to move a hearty vote of thanks for the very able and efficient manner in which our chairman, the Honourable Minister of Agriculture, has carried on the duties of chairman of this association's convention in the past few days. I think it comes from me with particular good grace to make the motion from the fact that I am the first man from the two provinces of Saskatchewan and Alberta that has directed attention to irrigation. I also think that dry farming should be known more largely as a method of more cultivation. Dry farming to my mind, however, is more than mere cultivation. The time will come in this country when we shall want to conserve every drop of water that is possible for the production of cereals and grasses. I quite agree with the chairman that a union of the two bodies of dry

farmers and irrigationists would be an advantage to both. I have very much pleasure in moving a hearty vote of thanks to the chairman of this convention.

The motion was carried with loud applause.

The CHAIRMAN: I wish to thank you very cordially for this manifestation of services. I am only sorry that I am not able to stay until the convention is over. You must all have felt the splendid spirit of co-operation that has prevailed throughout the discussions of this convention.

### FRIDAY MORNING SESSION, AUGUST 3.

Mr. G. R. MARNOCH, Chairman.

The CHAIRMAN: I will call upon Mr. A. Mitchell, who operates the nurseries Coaldale, Alberta, to address us.

Mr. MITCHELL: The subject that has been allotted to me, "Fruit Raising on the Prairie," would to some people from real fruit countries, seem like wasted time. I think that we could ever raise fruit on the prairie with the short growing season and the rigorous winters that we have would appear to them as preposterous. I hope, however, to be able to show you that something has already been accomplished in this direction and I will endeavour also to point out the lines along which further effort should be made. This question of fruit raising on the prairie reminds me of a gentleman I met in Calgary about fifteen years ago. He came from Ottawa and he had recently been at Maple Creek, and he told me that one of the party he was with made the prophecy that Maple Creek would yet be canning peaches. Now I have been around Maple Creek the last two days looking for the peach factory, but I was unable to locate it. Mind you, I am not saying it is not going to be here. I do not know what kind of a reputation that prophet had in his own country. It may be he was just carried away for the moment by an exuberance of real estate enthusiasm, but I would be loathe to think he was not a good prophet. We never know what this West is going to produce and I think there is just a possibility that we may yet be canning peaches or apricots at Maple Creek. I have seen peaches tried at Taber. That is I saw the tree planted but it did not live over winter.

In this country we have several disadvantages operating against success in fruit growing that are not met with in more favoured climates. We have heat and cold and drought and altitude and Chinooks, and last, and worst, we have a very short growing season. These make an awfully hard combination when you think of growing fruit and yet a great deal has already been done to meet these untoward conditions and produce fruit on the prairie.

There are two things essential in fruit growing, anywhere.

The first is, trees that will be hardy and live over from year to year; and the next is, trees that will fruit after they do live. In fruit growing, as in all crops on the prairie, the great thing is to get a plant that will mature between frost and frost. We all know this. It is the case with regard to wheat and the other grains, and the same holds good with apples and other fruits. Only in their case it is more pronounced for not only must the fruit be produced but it must be ripened early enough before the first frost comes in the fall.

This narrows up the problem very considerably, and many a promising tree has had to be discarded because, after years of trial, it was found always to require about another week or ten days to ripen its fruit when the killing frost struck it in the fall. For instance, in 1915, we had 154 new plums fruiting which had never fruited before.

and we expected bushels of ripe plums. That year, we had a killing frost about September 12 and out of all that lot, only four were ripe. All the rest were frozen. It was, of course, a very early frost, but these four trees were ripe on the second of September, ten days before.

Needless to say we look upon these four trees as being more precious than rubies, and on that extra early killing frost as a blessing in disguise, for we know now we have something that will ripen in most years in good time, and what that means to this country, all who are interested in the building up of a contented community will understand and appreciate.

Experiences of this kind are not very encouraging, but fortunately we have men among us who did not mind a little thing like that, and the history of fruit growing on the prairies is very largely the story of the work of a few individual enthusiasts who had a single eye to the one thing.

The Experimental Farms have done good work along certain lines, but if we had not had these other enthusiasts carrying on their own independent experiments in their own way all those years, fruit growing on the prairies would not have been so far advanced as it is to-day.

Mr. John Dixon, of Maple Creek, who is here with us, was one of these enthusiasts and so was his brother Joseph. The late Robert Kells was another Maple Creek man and there have been dozens of others scattered all over the West. The Dixons pioneered in plums and small fruits, and Thomas Clark of Macleod and Mr. McNabb of Lethbridge and some of the Mennonites around Rosthern, in plums. In apples, Dr. Hunt of Indian Head, the late Hon. T. W. Finlay, and W. McKay of Medicine Hat, Messrs Ririe, Mercer, Rasmusson and others of Magrath, Mr. Dué of Cardston, Father Van Tighem and W. H. Fairfield of Lethbridge, Major Campbell, R. G. Mathews, and Joseph Hicks of Macleod, and the late Thomas Daly of Clover Bar, east of Edmonton. These all grew apples ten years ago and more.

The growing of crabs has been fairly evenly distributed from Winnipeg to Edmonton and Calgary so that it may be said that, given the right kind of tree, shelter, soil and ordinary care, there is nothing to hinder most farmers from growing most of the crabs they require in most years. They have been grown successfully in Calgary, which is 3,400 feet above sea-level and at the ranch of that old pioneer, Mr. Joe McFarlane, about ten miles north of Cowley, and only about five or six from the Livingstone range of the Rocky mountains at an altitude of at least 4,000 feet. At these altitudes, the growing season is naturally shorter than most other places and yet crabs have been grown there.

There are doubtless many others throughout the prairies who were successful fruit growers ten to twelve years ago, but these are all known to me personally. I have been to all their places and seen the work they have done and I think it is only right their names should be recorded.

But the two great names of note among fruit growers on the prairies will always be D. W. Buchanan of St. Charles and A. P. Stephenson of Dunston, Manitoba. These two men have done more real original, painstaking, selective work, and for a longer period, than probably all the others put together. Mr. Buchanan's work is not so well known, but most people here will know of A. P. Stephenson, the Apple King of Manitoba. He has practically spent a lifetime in growing the Manitoba apple. It is not given to very many men to see their own monument, but he has his in the apple trees growing in the West. I was down at his place a few years ago, and you may be sure I was very much interested in his place and orchard. But the most impressive thing I saw there was the record he has kept of the different trees he has tried in all these long years. He had tried out some eighty-five varieties of apples alone, and it was most interesting to see the date of planting, where obtained from, and how the tree progressed from season to season till it reached the final record, *dead*, as it almost invariably did. What a monument of patience and perseverance and enthusiasm that book is to be sure. A record of worthy

work, the like of which surely is not to be found anywhere else in Canada. Work that will never be paid for and for which adequate recognition will never be given. He has about a dozen varieties of apples now, which he considers good enough to propagate.

Mr. Buchanan's work has been along the lines of plums, crab apples, cherries, gooseberries, and strawberries. Over thirty years ago, he began selecting native Manitoba plums and raising seedlings from cheney and mankato and now he has some fine fruits indeed to his credit. Of course, they will never be so big as those we get from British Columbia, but they are of good size, good to eat out of hand, make excellent preserves, and most important of all, they will ripen in most years, a week or ten days before the earliest killing frost on record.

The eastern cherry is not a success on the prairie. Nearly every fruit experimenter has tried it, but I have never seen or heard of any success. Even the tree does not live over, and Mr. Buchanan years ago settled down to improve the native Sand cherry or Rocky Mountain cherry, as it is sometimes called. In this he has achieved a notable success, and, from a small pucker, thin-fleshed cherry, he has developed something that is really worth while. The cherry is black, three-quarters of an inch in diameter, fleshy and sweet, with little or no pucker, good to eat out of hand and makes an excellent preserve. It is very prolific and seldom misses a crop. Of course they will not compare with Mr. Johnstone's prize-takers from Nelson, but they will grow on the prairie and are ripe a month before frost, and are, I am sure, destined to form no mean addition to the farmer's household resources in days to come.

The gooseberry is not a brilliant success on the prairie. Downing, Red Jacket, and the Pearl have been successful in some localities, I understand, but Houghton is really the only one we can depend on. But its berries are small and irregular, and so Mr. Buchanan applied himself also to improve it. He has now a fine plant which has larger berries and earlier, more prolific, and more even-sized than the original Houghton. These are all notable achievements in fruit improvement, and Mr. Buchanan deserves very great credit indeed for them.

Bush fruits, red, black, and white currants are hardy practically all over the prairies. Some of the finest red currants I ever saw, and certainly the greatest number I ever saw in this country, were grown by Mr. Joseph Dixon, about fifteen years ago. They were an inspiration to look at and a temptation to get in amongst.

Raspberries are hardy when handled right, notably Sunbeam, Loudon, Turner and King. They have to be buried under soil over winter to get crops, of course. It is easy to do. You just plough two furrows on each side of the row, bend the canes down, and cover them with a shovel. The ground is shaken from them early in spring. Straw will do, but the soil is far the best. Black Rasps are not a success.

Strawberries are being grown more and more every year. Senator Dunlap is the best variety, and the strain that is being planted is mostly from plants introduced by Mr. Fairfield before he was connected with the Experimental Farm, about fifteen years ago. Out of a large number, this was the only one that survived, and it has been so long established that nobody dreams now of its not being hardy. It is usually best to cover the plants with two inches, not more, of straw, just after freeze-up, but the last three years or so we have left ours uncovered and they have come through fine. Other varieties have, of course, been tried, Bederwood, Crescent, and Clyde, for instance, but the Dunlap is the best allround berry. The crop pays too, for from half an acre we planted out last year we netted \$62 worth, besides our own using. And so it goes on, the solution of the farmers' home-grown fruit problem. A few men here and there working away in patience and enthusiasm, amid all sorts of discouragements.

By and bye, after the shelter belts are grown, it will be a farmer's own fault if he does not grow most of his own fruit on his own farm. But there is still great room for improvement.



There are just the four ways in which to develop and improve fruits suitable for the prairies. The first is simply the old familiar "survival of the fittest," and is accomplished by trying out quantities of fruit trees obtained from somewhere else, till one or two are found hardy enough to stand the climate and ripen their fruit. This is a long and expensive process which, fortunately, in the case of apples at least, has been solved for us by Mr. Stephenson. The second is, improving our native fruits by selecting the best and sowing the seed, and repeating the process until the desired improvement is obtained. This is also a long and a haphazard process for a very small percentage of such naturally fertilized fruits produces anything better than the parent. The third way is to cross-fertilize artificially, with a view to accomplishing some definite result, such as early maturity or improved quality, or both. This is the way one would look for the most rapid improvement, but little or nothing has been done in this direction in the West. Dr. Saunders has produced some notable improvements on the Siberian crab in this way, but outside of this, and it may be some cross-fertilization of strawberries by Mr. Buchanan, little if anything of value has been done. It is work that takes special training, taste and facilities, and could be undertaken by some of our governments, either Dominion or provincial. Very few private individuals have either the means or the time to devote to work of this nature. The fourth way is, by introducing plants from foreign countries, and in this connection it may be said that almost without exception all the few apples that have proved hardy on the prairie are of Russian origin. More of this kind of work should be done. There are great unexplored horticultural possibilities yet to be discovered in Tibet and the high lands of Central Asia. For instance, a captain with a British expedition into Tibet some years ago found an apricot in cultivation 10,000 feet above sea-level in a dry country with a severe winter much like our own. That plant is now growing in Kew Gardens, England, and I suppose in time will be tried out here, and that is why I said I did not despair of yet seeing peaches or apricots being canned at Maple Creek. This is work for the Dominion. Canada should have two or three horticultural explorers abroad all the time. If any country needs such assistance it is Canada with her rigorous climate and northern situation. We have been too long content to rest on the enterprise of our neighbours to the south of us to solve this sort of problem for us. They can not do it. Our problems are our own, and we should, and can, solve them.

Such is the position of prairie fruit growing to-day. As I said before, much has been done, but much more remains to be done. At the opening of this convention, Mr. Motherwell voiced the key note of the convention when he spoke of, "Continuity of effort in farming." Continuity of effort is right, and if we want to encourage continuity of effort on the part of the farmer, there is no better way than to show him how to provide continuity of contentment and good living for his wife and his children on the farm, and one of the very best ways to do this, indeed, the only way, is to enable him to establish for himself, good, "homey" home-surroundings with plenty of trees for shelter and a good orchard and garden.

The CHAIRMAN: I would like to supplement the remarks of Mr. Mitchell about small fruits. There is a farm south of Grassy Lake in the driest part of southern Alberta where on dry land they have produced all the small fruit, required for the family, including strawberries, raspberries and currants. There is really no reason why if a farmer will devote a small portion of his time to improving farm surroundings, that he cannot grow enough fruit for his family requirements. Probably Mr. Fairfield might like to say something about windbreaks for fruit and the necessity of covering fruit vines.

Mr. FAIRFIELD: In regard to the matter of windbreaks. We find in Lethbridge on the Station, and of course it will apply to all the country usually spoken of as the "Chinook belt," that windbreaks are absolutely essential to the growing of small fruits. The best illustration of the need of this is the fact that on some of our

orchards at the Station, the wind erosion is so great on apple trees some distance from windbreaks that the roots are exposed. On dry land we have to have clean cultivation and as the tree gets larger, the wind would sweep down and get underneath, eating in and taking the soil out from under the branches of the roots and the trees suffer injury in that manner. Another reason is that the more tender stuff require the protection of the trees. Windbreaks are very easy to grow where poplars and willows and Manitoba maples are used in rows. In the Chinook Belt proper, the west is the more important direction to protect from the wind. It is good practice to have it on the north and probably on the south side too, but we find that it is more important to have a windbreak on the west side.

Mr. Mitchell spoke about the covering of strawberries and raspberries. There is one point that stress should be laid upon and that is the mulching of strawberries. Quite often beginners in growing plantations of strawberries are inclined to use barnyard manure to mulch with. In my observation I have found that in four times out of five the manure will kill the strawberries. It seems to pack down too close and smother them. In any event the plants are found to be dead in the spring. They require a looser mulch than barnyard manure. Straw that is found to be free of weed or grass seeds is good, but something looser is even better. The mulch not only protects the crowns of the plants, but also helps to retain moisture. My experience in covering strawberries has been that no covering is of much use except the moist earth. Some years ago we delayed covering the strawberries until quite late in the fall and the ground was frozen and we used frozen soil. It was quite dry and laid in a lumpy condition so that in some places there were not enough air spaces with the result that we found a large number dead or nearly dead in the spring. My idea of raspberries dying is not so much the cold weather, but the cold weather combined with the dry weather. The raspberries do not really die, that is the roots, but the canes, the part of the plant that is fruit bearing is dead and it does not matter to us how long our plants stay alive, if we do not get fruit. Consequently it is important to get the moisture.

Mr. JOHNSTONE: When I arrived in Nelson I was told I could not grow corn and that all sorts of fruit could not be grown there, but being of the same nationality as Mr. Mitchell I was hard-headed and I planted the same sort of garden that I had in Virginia. In a short time I got the same results from my work as were obtained by me in Virginia. I have tried about one hundred varieties of different things without results, but I have got results from many others by trying. I do not think, however, that you will be able to grow the tender varieties of cherries here on account of the climatic conditions, but there is no saying what other fruits can be grown here until a lot of effort has been made.

Mr. BROWN: What would you do with a plum tree that will not bear?

Mr. MITCHELL: I would do as it advises in the good book. "Cut it down."

Mr. BROWN: I bought a place a number of years ago and there were quite a number of different fruit trees there. One was a plum tree and I was told to cut it down as it would not bear. Later I was talking to an old man and he said, "Bore a hole in it and you will get fruit or put a spike through it." So I went home and after I had driven a spike I found it much easier than boring a hole so I drove two or three of them and then drove a row of shingle nails in for good measure. Now it is bearing plums in very fine condition indeed and I have had to prop all the branches up.

Mr. MITCHELL: I was told recently that one way to force fruit was to run a knife down the north side of a tree. I know that you can force fruit. A tree that will bear a full crop this year will not bear so liberally next year. You have to regulate your

orchard so that they will be bearing a good average each year. By pinching back the buds or disturbing the tree you alarm it in other words and it yields, and it will reproduce itself more lavishly in order that it will not die. As a rule it is better to have two or three varieties of plum trees growing together so that cross pollination will take place as a plum tree is not self-fertile—some of it will not pollenate.

Mr. LINFIELD: Prosperity interferes with production. Alfalfa does not grow seed well. You have to interfere with its growing conditions. An apple tree does not always bear fruit, but it is strong and has a good production of leaves. If you do anything to disturb the tree or check the growth of leaf you will get fruit. That is the explanation of why this gentleman obtained a yield of fruit by boring holes or driving nails in his tree. It disturbed the growing condition. I think the same will apply to a great many things.

Mr. HUCKVALE: The Credentials Committee has to report that there are 158 delegates, which includes 24 visiting delegates.

The CHAIRMAN: In the matter of the next place of meeting, the secretary has some communications to read.

The SECRETARY: Before Mr. Biker left he handed me a message to read to this convention. He says:—

I am here at this convention representing the Hon. T. D. Patullo, Minister of Lands of British Columbia, also Mr. D. Young, Comptroller of Water Rights, and to present to you their sincere regrets at not being able to be with you. Some of you in this room will remember previous conventions held at Kelowna, Penticton and Kamloops, and will remember the very complicated problems arising at those meetings which are still before our department for solution. It may be of interest to state that the chief reason for Mr. Patullo's absence to-day is caused by the very dry spell we have experienced of late in British Columbia, making the irrigation problem there very acute and he and Mr. Young are now on a tour holding meetings daily with the water users in order that the present Government can decide on the best policy to pursue in the matter.

It may appear on the first blush that this question has been held over too long, but I hasten to assure you that since the convention at Vernon our department has (and even before that date) continued field and office investigations, with the result that within a very short time a policy will be enunciated which has for its object the protection of the water user, or the man on the land.

I give you my Minister's best wishes for a successful convention coupled with the hope that he may meet you at Nelson in 1918, when he will give you in person many details of the very intricate problems British Columbia has to face.

I have also a letter from the Nelson Board of Trade inviting this association to hold its next convention at Nelson, B.C.

After discussion, it was moved by Mr. Huckvale, seconded by Mr. Dixon, that this association hold their next annual convention at the city of Nelson.

Carried unanimously.

Mr. DIXON, on behalf of the Nominating Committee appointed by the President, we submit our report.

The SECRETARY: In addition to the usual report, it is the opinion of the committee that the present Governor General should become a patron of the association, particularly as it is well known that he is himself an agriculturist and an official very much interested in agriculture in this country.

The following is the list of recommendations:—

Honorary President, Minister of the Interior, Ottawa.

First Honorary Vice-President, the Minister of Agriculture, province of Alberta.

Second Honorary Vice-President, the Minister of Agriculture, province of Saskatchewan.

President, the Minister of Lands, British Columbia.

First Vice-President, Honourable Hewitt Bostock.

Second Vice-President, Mr. G. R. Marnoch.

Executive: Mr. R. G. Williamson, Maple Creek, Sask.; Mr. James L. Brown, Kamloops, B.C.; Mr. A. S. Dawson, Calgary, Alta.; Mr. James Johnstone, Nelson, B.C.; Mr. F. H. Peters, Calgary; Mr. W. E. Scott, Victoria, B.C.; Mr. F. H. Auld, Regina, Sask.; Mr. F. R. E. Wollaston, Vernon, B.C.

The report was adopted.

The CHAIRMAN: We will now have an address from Mr. A. A. Dowell.

MR. DOWELL: I consider it a privilege to be asked to address this convention on the subject of "Sheep in Western Canada." There was a time when a speaker had to resort to a fund of jokes and stories to interest his hearers in the subject of sheep. Not so to-day. With present prices for wool and mutton, the raising of sheep is being more carefully studied than ever before. From recent market reports I find that females of all ages are being eagerly sought for breeding purposes. And rightly so, for any animal that can produce both food and clothing for our families, and do so at a reasonable profit, is assured of a permanent place in our system of agriculture. Five years hence they will be found on far more farms than they are to-day.

The raising of sheep fits in well with any system of mixed farming—a thing which every Canadian farmer must resort to sooner or later, in order to maintain the high production of his fields. In any new country, the first system practised is mining the soil by the growing of grains. The decreased fertility and incoming weeds make the producing of live stock imperative. A wiser plan would be to combine the two at the outset.

It will be interesting to note some of the advantages of sheep production. A small band of breeding ewes can be purchased with much less capital than any other farm live stock. They insure a steady income through the sale of wool and lambs. They will eat over 90 per cent of our farm weeds and can be used to advantage in clearing bushy land. Weed seeds are entirely destroyed during digestion. Excellent results can be obtained without the expense of elaborate buildings. Much feed is utilized that would otherwise go to waste, in the stubble field, along lanes, fences and the like. Sheep make cheaper gains than cattle, though perhaps not equal to the pig in this respect. They consume relatively smaller amounts of water, which is quite an item in the dry sections, particularly during the winter months. Incidentally sheep bed down at night on the higher, thinner land which is enriched by the droppings. Then, too, the housewife is furnished with excellent meat in carcasses of convenient size.

Any one who is seriously considering the purchase of a small flock of ewes, should be aware of the difficulties which will sooner or later confront him. In the first place, sheep men are born, not made. One must like sheep to make a success of the undertaking. Then there are the losses due to dogs, coyotes and wolves. Such losses have driven many breeders out of business. This can be avoided on the range by having a shepherd constantly with the flocks. The small farmer will find the best insurance in suitable fencing.

In the early development of the country, sheep were raised largely for wool. With the increasing demand for meat, more attention was given to combining a mutton



form along with a reasonable fleece. At this time, the beginner will find three distinct types from which he can make his selections—fine wools, represented by the American Merino, Delaine Merino and Rambouillet; medium wools, chief among which are the Shropshires, Hampshires, Oxfords, Southdowns, Suffolks, Cheviots and Dorset Horns; and long wools, as found in the Lincoln, Cotswold and Leicester breeds.

The fine wools are more or less covered with wrinkles and are grown chiefly for the extremely fine wool, while the latter two types are grown for both mutton and wool. Under range conditions in Western Canada, the long wools are often objected to because of the open fleece which holds the rain and snow, and results in colds. Fine wool breeds lack mutton form and also suffer from the severe winters. In point of numbers, the medium wool breeds are far more popular in this country. Range men prefer some Merino blood in their sheep, however, as it insures a dense fleece and preserves the flocking instinct.

It will be well for the beginner to start with a small flock of grade ewes. This flock will increase in numbers along with the owner's experience. A few purebred ewes may be added later, and with the knowledge gained through handling the grade flocks, success will be assured. In selecting the ewes, each one would be examined as to mouth and udder. Spoiled udders mean certain trouble at the lambing time. "Broken mouths," by which is meant ewes of advanced age—shown by massing teeth—must be avoided. Incisor teeth, eight in number, appear in the lower jaw only. The lamb will have eight small teeth. At one year of age or shortly following, the centre pair will be replaced by a pair of large mature teeth. At two years, one tooth on each side of the centre pair will appear. The three-year-old will have six permanent teeth, with the corners coming up at the fourth year, when a full mouth is shown. By this time, the teeth begin to space and grow narrow. Then they begin to fall out, by which is meant the "broken mouth," and warns one of advanced age and loss of grazing powers. Ewes begin to decline at around five years of age, though with special care, are often productive up to ten years or more.

A word of caution might well be added here. With the present high prices for grain and the short crops in many sections, there will be a tendency to sell many ewes that should be retained for breeding purposes. One needs only to remember that there is a world shortage of both mutton and wool and that, in 1915, Canada had only 2,038,662 sheep on hand.

Next comes the question of just how to proceed to improve the foundation flock. This can be done only by using good pure-bred rams, as shown by an experiment carried on at the Missouri Station in 1911-12. A band of common western ewes were purchased, half of which were bred to a scrub western ram, and the balance to a pure-bred Hampshire. The difference in gains of the two groups of lambs was not as great as might be expected, but the chief difference came at marketing. Under identical conditions of feed and care, the lambs by the scrub ram sold in the St. Louis market for \$4.50 per cut, while the lambs by the pure-bred sire sold for \$7.35. No doubt several buyers could be found at that figure to-day.

Under range conditions, a yearling ram should not be given more than 30 ewes, with 40 as the limit for the mature ram. Where "hand coupling" is practised, a yearling ram can handle 50 ewes during the season, with as high as 75 to 90 in mature form. A ram lamb should not be turned with ewes on the range. Under farm conditions he may be mated to 1 to 20 ewes without checking his growth or impairing his future usefulness.

The proper time for breeding depends upon the facilities for handling the ewes at lambing time. Pregnancy period for ewes is 146 to 147 days. Show lambs must necessarily be dropped early, which necessitates warm housing and careful attention. May or even early June lambs will be more satisfactory for those with insufficient help and limited building space.

All rams should be separated from the ewes before cool weather begins in the fall, for ewes will begin to show signs of mating at that time. Then about three

weeks before the breeding season comes the "flushing period." This means increasing the feed so that the flock will be gaining in flesh at the time of service. "Flushing" results in all ewes coming in heat at more nearly the same time, so that the lambs can be marketed at about the same age and weight. Rape pasture is excellent for this purpose, though roots, bran, oats and the like may be used with good results.

Too close confinement during pregnancy, even with the best of feed, leads to weak, flabby lambs. Plenty of exercise with protection from the winds and snow, along with suitable feed and water is necessary to insure a strong, vigorous lamb crop. Alfalfa hay has no superior as a roughage. In fact, if this is available, no grain is needed up to within three weeks of lambing time, when a little oats should be added. Where alfalfa is not available, prairie hay and whole oats will give excellent results. Timothy hay is not a sheep feed and should not be used if it can be avoided. Every precaution should be taken to keep the ewes in the pink of condition—neither too fat nor too thin. Fat ewes produce the weak, flabby lambs, while those in an emaciated condition are often unable to deliver their lambs. Water and salt should be available at all times. The common practice of forcing sheep to eat snow should be discouraged. Sheep require but little water—from one to six quarts per day—but that little is needed.

For March and April lambing, each ewe should be placed by herself at the expected time. When running with the flocks the new-born lambs are often tramped to death, or in case of twins or triplets become separated from the ewe so that but one will be claimed by its mother. Ewes recognize their offspring by sound and scent only. Little difficulty of this kind is encountered where the lambs are dropped in the open. At the time of lambing, heavy wooled ewes should be "tagged" so the lamb will find easy access to the udder. Time will not permit discussing the care of weak or unclaimed lambs.

Shepherds prefer to have all shearing over either before or soon after lambing, for, regardless of the season, such work cannot be carried on at that time. For late lambing, shearing is often done prior to that time, though ordinarily it comes later. Such work should be done after the chilly spring days are over and shortly after the warm sunny days have started the yolk. For this district late May or early June will be the proper time for shearing. If allowed to run too long, there will be considerable loss of wool besides the unnecessary discomfort to the flock. Power shears are preferred to hand work, as a much neater job results along with a trifle more wool. Experiments show a saving of four ounces of wool per sheep, which is well worth considering when, at present prices, two and one-half ounces of wool will pay for the shearing.

Docking is not practised simply to add to the appearance of the sheep as some seem to believe. It prevents the collection of filth at the rump with the attendant loss from maggots. Incidentally, it also adds to the market price. This should be done when the lamb is from seven to eleven days old, either with a sharp knife or hot iron. The hot iron is to be preferred as it prevents the usual loss of blood. Male lambs intended for market should be castrated about one week after docking. If these two operations are performed at an early age the shrinkage is much less than if allowed to run until more mature. Under range conditions lambs are usually docked and castrated at the same time, even though the shrinkage is usually quite heavy and an average loss of one per cent.

The entire flock should be dipped at least twice a year, and preferably twice—immediately after shearing and then again when brought into winter quarters. Any prepared sheep dip or coal tar preparation will give good results. Lice and ticks which are responsible for many an unthrifty flock could be entirely avoided at little expense in time and money.

Lambs will begin to eat grain at two to three weeks of age. The small farmer will find it very profitable to provide the youngsters with a creep where they can have access to crushed oats and bran for the first two months, and then whole oats up to marketing. Well grown lambs should average 80 pounds at four months.

Range men usually figure a ninety per cent increase in the flock as very satisfactory. Under farm conditions, this can be raised to 120 per cent and often much higher. I remember of one flock of 100 ewes with an increase of 165 per cent, a record well worth striving for.

Fall rye will be found an excellent early spring pasture. This may be followed with oats and peas, and rape later in the season. One will be surprised how many sheep can be handled in a limited area, where attention is given to suitable pasture crops.

Lambs should be weaned at four months, so that the ewes will have to prepare for the coming season. Care must be taken to prevent spoiled udders in the heavily milking ewes. The best ewe lamb should be retained in the flocks and the plainer ones marketed with the wethers. By using good rams each year, it is only a question of time until the original grade ewes will be replaced with the thick early maturing sort, so much in demand.

Every sheepman should make himself thoroughly acquainted with the more common sheep troubles and diseases. I will not have time to go into that phase of the subject, but in closing, wish to say something about the care of wool.

Wool is now sold on a quality basis, so that the man producing clean, sound wool is paid accordingly. As ever, money speaks louder than words, so we can expect a marked improvement in the quality of the wool in the near future. Wool twine should be used in tying the fleece—binder twine, wire and the like, never. Any foreign material such as binder twine, timothy heads, burrs, tags, tatoo paints and dirt, not only make the scouring process much more difficult, but often result in an inferior grade of clothing. Keep the fleece as clean as possible, fold it up with the inside out, tie with wool twine, and place in the large wool sacks made for the purpose. I believe I have already exceeded the time allotted. It is always a privilege to me, to appear as a champion of more and better live stock. I thank you for your patient hearing.

The CHAIRMAN: I think Mr. Dowell is a very decided acquisition to the sheep industry of Alberta, and I am sure we all appreciate very much his address.

I would like to suggest to the executive of this association that they should follow up the feeding of the products from the irrigation farms to sheep. I think also the farmer on a quarter or a half-section should do something more in the sheep-producing line. The eternal pork and bacon that is served up on the farm is very monotonous indeed. It should be varied by mutton from time to time. Mutton is an exceedingly palatable food and the small carcass is easily taken care of. More so, I should think, than the bigger carcasses of pork.

I will now call upon Prof. F. B. Linfield, Director Montana Agricultural Experimental Station, Bozeman, Montana, to address us on "Sweet Clover."

Prof. LINFIELD: In the development of a new agricultural country our first problem is to determine what varieties of crops are best adapted to the country and what methods of soil and crop management will enable these crops to yield their best. In our northern country this pioneer farming is almost altogether a production of cereal crops—wheat, oats or barley, and flax. In a few years, however, we find that the reduction in fertility and the introduction and multiplication of weeds, makes continued grain growing less and less profitable. A permanent agriculture demands a different system of farming and the sooner the new settler can get started on a permanent basis the better for himself and for the country.

Our studies of the old and permanent system of agriculture show that they produce three types of crops from the soil—

- (1) Cash crops: such as cereals and other grains.
- (2) Soil enriching crops: clovers, alfalfa, hay and corn.
- (3) Soil cleaning crops: corn, potatoes, field roots and other cultivated crops.

If all these crops are to be fully utilized upon the farm, live stock of course must be kept as some of the grains, all of the hays and much of the soil-cleaning crops can find profitable use only as food for live stock. It is, I presume, out of your need for a suitable soil enriching crop that you have asked me to discuss with you the use of sweet clover.

Now I do not want to present sweet clover as a competitor with alfalfa, which has been so well and ably discussed at this meeting. When alfalfa does well, as I notice it does under irrigation at Lethbridge, I would use alfalfa, unless you wanted a shorter rotation than alfalfa fits into. My first experience with sweet clover was in the state of Utah some twenty-three years ago. The white variety was very common in waste places and along the roads, growing sometimes as high as a man on horseback. While not growing as tall this plant is also found all over Montana. Its vigour of growth under a great variety of conditions, and the success which a few farmers were having with the crop both as pasture and as hay, has led the Montana Experiment Station to undertake some definite experiments with the plant. Our tests have not been continued long enough to warrant further conclusions than that the plant is a good yielder and that, whether as pasture or hay, stock do well upon it when they learn to eat it.

To know the value of any plant we must know something of its characteristics and its comparative worth as compared with other crops grown in the same locality. There are many varieties of sweet clover, but only two are common in our northern country—The white-flowered (*Melilotus alba*), and the yellow-flowered (*Melilotus officinalis*). Both are biennial plants. The white is the larger and stronger growing variety but our results do not show much difference in yield. Each has its advocates, but further experiment is necessary to determine positively their relative value. A study of the characteristics of this plant shows its wonderful adaptability to a great variety of conditions. It is a very vigorous and rapid grower, attaining a height of five to ten feet. Extreme of heat or cold does not seem to affect the plant. It grows well in the extreme south, and all the way between, up to and including Montana, where it grows well in nearly every part of the state. It can withstand very great extremes of wet and dry soil. It will grow on stronger alkali soil than any other farm crop. In fact, it has considerable renovating power when grown on such soils, in preparation for other crops, particularly alfalfa. It will also grow better on very poor soils than any other leguminous plant, but to do its best such soils should be rich in lime, and may have to be inoculated.

A peculiarity of this plant is that it needs a very firm seed bed. It will even start on hard compact soil if moisture is available. It does not germinate readily or grow well on loose open soils. Sweet clover is a strong nitrogen gatherer, the roots being loaded with nodules, even on poor soil. It is thus a great soil enricher. Some soils need inoculation, but this is not commonly the case in Montana. If it should be necessary, the same method should be followed as for inoculation for alfalfa.

As the plant is a biennial, it does not grow very high the first year but stores up a large food supply in its fleshy roots. The second season it develops to its full height and if permitted to do so, matures a heavy crop of seed. At the end of the second season the plant dies; the roots thus adding much humus to the soil.

As a rule the seeds are slow to germinate as there are many hard coated seeds. Probably not more than half the seeds will germinate the first season. This means a little thicker seeding than for alfalfa—say 15 to 20 pounds per acre. In the drier sections of the country on the dry lands, the crop may be seeded in rows 12 to 24 inches apart, when 4 to 6 pounds of seed per acre will be plenty.

Sweet clover produces a very fine quality of honey and as it flowers profusely and continually through the season it provides a large quantity of honey for the honey-bee, and in some parts of the country has been seeded in waste places by the bee-keepers to provide a honey crop. It is valuable as a fodder crop only in its early stages of growth, as after it is in full bloom it gets very woody and the leaves fall.



The crop should be seeded in the spring on a firm seed bed. Fall-ploughed land or land that has had a cultivated crop the year before is to be preferred. Spring-ploughed land should be very firmly packed before seeding to sweet clover. A nurse crop if seeded rather thinly, may be used particularly if planted in rows. On the dry farm, however, it is preferable to plant without a grain crop, and when seeded broadcast, considerable feed will then be obtained the year of seeding. Probably the greatest value of the sweet clover is as pasture. It should have a good start in the spring, and then enough stock kept on the field to prevent it from gaining on them. If it should get ahead of the stock the crop should be mowed down. The plant is an early grower in the spring so that it will make one of the earliest pastures. Another advantage is that it very seldom bloats stock, whereas there is always more or less danger with alfalfa. All classes of live stock do well on sweet clover pasture but hogs especially so.

When used for hay, cut the crops when the first few blooms appear. It should be cut about four or five inches above the ground, as unlike alfalfa the second crop grows from low branches and not from the crown. Thus if the crop is cut so close to the ground as to remove the branches the next crop is very much reduced. In the moister parts of the West the first crop may be cut for hay and the second left for seed. At the present time there is good money in the seed crop. For seed the crop may be cut with a binder. The seed however, drops off readily, so that it is advisable to put pans under the binder, one where the table and elevator canvases join and the other under the knottor. These will catch the larger proportion of the seed thrashed out by the binder. As sweet clover is a biennial plant provision should be made so that it re-seeds itself. If pastured or cut too close, no seed will be formed so the plant will disappear after the second year. Sweet clover is such a vigorous grower that to many farmers it appears to be a weed. However, it seems to grow mainly in waste places only and does not usually trouble the cultivated fields. When growing along irrigated ditches the seed is frequently carried into cultivated fields. This is not usually objectionable, however, except for alfalfa fields kept for seed.

Sweet clover is not readily eaten by stock, because of its bitter taste. Usually, however, once they have learned to eat it they seem to relish the sweet clover as well as they do alfalfa. As sweet clover is one of the earliest growing plants in the spring, stock turned on this crop as early pasture generally soon learn to eat it. Sometimes the stock have to be starved to the fodder by confining them to sweet clover alone. Salting the sweet clover hay will usually encourage the stock to eat it without any difficulty. After the animals acquire the taste for the crop they do as well upon it as upon any other fodder. The chemical composition of the plant is very similar to that of alfalfa. Some of our analyses indicate that it is even richer in protein than alfalfa. It is, therefore, when cut at the proper stage, a strongly nitrogenous food and may be used with advantage with more carbonaceous fodders. Compared with alfalfa, sweet clover is a stronger grower, and a much larger plant. It is richer also in protein, when cut in early bloom which is the best time for making hay. Is it not to be recommended as taking the place of alfalfa or red clover where these do well. Sweet clover has a greater range of adaptability than alfalfa, and will grow on soils too damp and too alkaline for the successful growth of alfalfa. It is sometimes used as a preparatory crop for alfalfa particularly on alkali and heavy soils. It appears also to require the same type of bacteria for inoculation as alfalfa, thus serves in this way as a preparatory for the alfalfa crop.

As sweet clover is a biennial, it fits well into a short rotation as a soil enriching crop, in this again having some advantage over the alfalfa, which fits to advantage only into a long rotation.

To those who would like to read up more fully on sweet clover I would refer them to the following publications:—

Sweet Clover: Growing the Crop. Farmers' Bulletin No. 797, U. S. Department of Agriculture.

- Sweet Clover: Utilization. Farmers' Bulletin No. 820, U. S. Department of Agriculture.
- Sweet Clover: Harvesting and Thrashing the Seed Crop. Farmers' Bulletin No. 836, U. S. Department of Agriculture, Washington, D.C.
- Sweet Clover: International Harvester Company, Chicago, Ill.
- Forage Crops for the Colorado Plains. Colorado Station, Bulletin 214 (1915). (Includes directions for growing sweet clover.)
- Aberdeen Sub-station. Idaho Station Bulletin 84 (1915). Promising results reported with sweet clover.
- Irrigated Agriculture in the San Luis Valley. Colorado Station Bulletin 209. (Suggestions for the production of sweet clover.)
- Report of the Agronomist. Wyoming Station Report, 1915. (Germination of sweet clover seed.)
- Monthly Bulletin of Western Washington Sub-station, vol. 1, No. 3. (Alfalfa in Western Washington and sweet clover.)
- Silage and Grain for Steers. South Dakota Station Bulletin 160 (1915). (Analyses of sweet clover hay.)
- Journal, Amer. Soc. Agron., 7 (1915), No. 4. (The effect of different methods of inoculation on the yield and protein content of alfalfa and sweet clover.)
- Forage Crops. Wyoming Station Bulletin 104 (1914). (Sweet clover makes a good crop where alfalfa cannot be grown.)
- Sweet Clover. Michigan Station, Circular 23 (1914).
- Report of work on Sub-station Farms. Oregon Station Bulletin 119 (1914). (Cropping methods discussed include sweet clover.)
- Trials with Sweet Clover as a field crop in South Dakota. South Dakota Station Bulletin 151 (1914).
- Minor Dry Land Crops at the Nephi Experimental Farm. Utah Station, Bulletin 132. (Sweet clover noted as of little value under these conditions.)
- Green manuring and cover crops. Mass. Station, Circular 37 (1914). (Sweet Clover.)
- Forage crops in Central Washington. Washington Station Bulletin 128 (1916). (Brief notes on results of trials including sweet clover.)
- Work with Field Crops. North Dakota Station, Report Dickinson Sub-station (1913). (Cultural tests with sweet clover.)
- Work with Field Crops. Minnesota Station, Report 1915. (Experiments pointed out the value of inoculation and liming.)
- Sweet Clover. Wyoming Station, Bulletin 110 (1916).
- Sweet Clover, Circular No. 62, Montana Experimental Station, Bozeman, Mont.

Mr. BARK: Do you have to leave some growth on the first season?

Prof. LINFIELD: We have not had any trouble in that way. Last year was the most severe winter we have had and it has come through much better than our alfalfa did. The yellow flowering kind came through better than the white. We have a 95 per cent stand this spring.

Mr. BARK: Was it mowed down last fall?

Prof. LINFIELD: No, we do not mow it close down. Even the second cutting is left high. Stock will eat this very well if it is run through the cutting machine.

Prof. FAIRFIELD: When making two cuttings of clover on the irrigated land was there any difference in the fineness of the plant?

Prof. LINFIELD: I cannot answer that because in the reports I get about our growing of it I found no comment, so I do not believe there could be any contrast. On the piece I noticed myself I found no particular difference.

Mr. PORTER: How does it compare in the cost of seeding?

Prof. LINFIELD: Just now it is costing more than alfalfa owing to the fact that there is not much seed to be had down there.

CHAIRMAN: We will now have the Chairman of the Resolution Committee submit the resolutions of the association.

1. Resolved by the Western Canada Irrigation Association in convention assembled,—

That the governments of the Empire should accept the sole responsibility of the settlement and future welfare of the Empire's sailors and soldiers, together with their dependents.

And that the Western Canada Irrigation Association pledges itself to do all in its power, individually and collectively, to assist in the settlement of returned service men.

And that a copy of this resolution be forwarded to His Excellency the Duke of Devonshire and to Mr. Herbert Easton, Honorary Secretary, British Immigration League.

2. Whereas the limitations of irrigation are determined by the amount and regularity of stream flow, and the latter are to a great extent dependent upon the presence of forests in the watershed; and

Whereas protection and development of the forests serves the dual purpose of conserving the timber and the water supply; and

Whereas the members of the Cypress Hills Water Users' Association are almost entirely dependent for water for irrigation purposes on streams rising in and flowing from the Cypress Hills Forest Reserve;

Therefore be it resolved by the Western Canada Irrigation Association in convention assembled to request the Honourable Minister of the Interior to make inquiries as to the steps which may be necessary to inaugurate a definite and substantial policy, the effect of which would be to re-establish as soon as may be possible the forest cover in the Cypress Hills Forest Reserve.

Whereas an accurate knowledge of the location, quality and quantity of water supply available is the basis of irrigation development, and

Whereas the matter of topographic and hydrometric surveys to determine the location and quantity of such water supply and the proper methods of conserving it must be undertaken by the Government administering the law relating to the use of such water, and

Whereas it is understood that the Governments concerned find it necessary to curtail expenses as much as possible, and whereas it would be a great misfortune if the work already started should be interrupted, as records missed cannot be recovered,

Therefore be it resolved that this convention urges strongly upon the Dominion Government and the Government of the province of British Columbia, the importance of making the necessary appropriation and providing the necessary staff to continue, without interruption, the work of gauging all streams of water supply.

That the Western Canada Irrigation Association is in accord generally with the endeavours of the recent conference at Lethbridge on more and better water for our farmers, and is in harmony with the general principles of the resolutions passed at the conference.

That the Western Canada Irrigation Association desires to invite the attention of the Public Health Departments of British Columbia, Alberta and Saskatchewan to the necessity for generally advising on and supervising the waters in irrigation ditches to prevent pollution, in the general interests of the public health, with particular reference to the matter of the location of barnyards, etc., the drainage from which finds its way into ditches, the water from which is often the sole source of domestic water supply.

Resolved that this association endorse the principle of encouraging more inter-provincial co-operation in the consumption of home products;

Therefore be it resolved that the members of this association use every effort to encourage the consumption of such products.

Thanks were also tendered to the speakers: to the mayor, officials and citizens of Maple Creek for courtesies extended to the management of the local stampede, to the press, to the members of the Cypress Hills Water Users' Association, and to the Minister of the Interior for printing the report of the convention.

MR. PEARCE: I think we should pass a resolution thanking the Department of the Interior, and of which department Mr. Drake here is the representative, for their very kind support in publishing the annual report of this association.

MR. DRAKE: I think I can promise you on behalf of the Minister that notwithstanding the greater economy practised at this time, and also the cost of printing, the department will again take the responsibility for the publishing of this report. It has given us great pleasure personally to read over the proceedings of this association and I may say that we have watched with great interest the splendid growth of this association from year to year.

THE CHAIRMAN: The convention will now stand adjourned *sine die*.

#### DELEGATES ATTENDING MAPLE CREEK CONVENTION.

W. R. Abbott, Geo. A. Adams, Maple Creek; Mayor Annabel, Nelson, B.C.; C. Anderson, A. O. Anderson, Maple Creek; Wm. Argue, Golden Prairie, Sask.; J. G. Armstrong, C. M. Armstrong, T. C. Armstrong, Maple Creek; E. M. Arnold, Canadian Society of Civil Engineers, Calgary; F. H. Auld, Deputy Minister of Agriculture, Regina; John Badhen, Maple Creek; Don. H. Bark, Chief of Irrigation Investigations Division, Canadian Pacific Railway, Strathmore, Alta.; C. W. Baker, Assistant Secretary, W.C.I.A., Calgary; E. A. Bell, Alderman, Medicine Hat; Thos. Berle, Robsart, Sask.; W. J. E. Biker, Department of Lands, British Columbia, Nelson, B.C.; Prof. J. Bracken, University of Saskatchewan, Saskatoon; F. D. Brown, Coulee, Sask.; J. L. Brown, Kamloops, B.C.; R. J. Burley, Canadian Society of Civil Engineers, Ottawa; W. A. Burton, Medicine Hat; B. Cheeseman, Maple Creek; P. Chevalier, Mayor of Maple Creek, Maple Creek; H. A. Colquhoun, Maple Creek; Robt. Clark, Alfred Clark, Consul, Sask.; J. W. Colquhoun, Maple Creek; Geo. H. Coulter,



Piapot, Sask.; Frank Cross, East End, Sask.; S. Cruikshank, Mayor of Medicine Hat; Mrs. A. Cumberland, Miss Cumberland, A. Cumberland, W. H. Curley, Rev. T. J. Davies, Maple Creek; A. S. Dawson, Chief Engineer, Department of Natural Resources, Canadian Pacific Railway, Calgary; D. B. Detwiler, John Dixon, W. B. Dixon, D. C. Dixon, Jos. Dixon, W. Dobbin, Maple Creek; A. A. Dowell, Professor of Animal Industry, University of Alberta, Edmonton South; E. F. Drake, Superintendent of Irrigation, Ottawa; J. K. Edwards, Maple Creek; M. Elliott, Cross, Sask.; E. E. Eisenhauer, Swift Current, Sask.; Prof. W. H. Fairfield, Supt. Dominion Experimental Farm, Lethbridge, Alta.; E. J. Ferroby, Wm. Ferraby, Maple Creek; E. J. Fewangs, Medicine Hat; E. H. Finlayson, District Inspector of Forest Reserves, Calgary; M. M. Fleming, E. A. Frederick, Maple Creek, Saskatchewan; M. H. French, C.S.C.E., Calgary; W. R. Fulton, Walsh, Alta.; A. Fontaine, Gravelbourg, Sask.; M. D. Geddes, Farm and Ranch Review, Calgary; H. Gelmer, Pasqua; Herbert Gold, F. F. Grage, M. S. Grey, G. R. Hammond, John Hansen, Maple Creek; Mrs. T. A. Hargrave, T. A. Hargrave, Walsh, Alta.; Edward Harrison, Amelia P.O., Sask.; G. S. Herring, Manager Merchants Bank of Canada, Maple Creek; D. G. Hewitt, R. S. Hodson, Maple Creek; D. B. Howell, Yorkton; Walter Huckvale, Medicine Hat; J. E. Ingram, J. H. Jamieson, Maple Creek; Albert Johnson, Krupp, Sask.; Jas. Johnstone, Nelson, B.C.; Joseph Kisell, Nashlyn, Sask.; Prof. L. S. Klineck, Dean of Faculty of Agriculture, University of British Columbia, Victoria, B.C.; Olaf Kobberstad, Krupp, Sask.; Thomas Kokott, East End, Sask.; W. F. Lawrence, Maple Creek; J. M. Leamy, Canadian Society of Civil Engineers, Winnipeg; H. Le Pargeneux, Maple Creek; F. B. Linfield, Director, Montana School of Agriculture, Bozeman, Montana; S. H. Linney, Medicine Hat, Alta.; Jas. Little, A. E. Littlejohn, Maple Creek; F. M. Logan, Assistant Dairy Commissioner, Regina; W. J. Lyman, T. McBrien, Maple Creek; W. T. McDonald, Department of Agriculture, Victoria, B.C.; Jas. McGarry, Coulee, Sask.; Hugo. Maguire, Maple Creek; A. D. McKinnon, Battleford; Mrs. Jas. McKinnon, Jas. McKinnon, Vidora, Sask.; Mrs. McMurtry, Moosejaw; F. D. McNaughton, Canadian Pacific Railway, Brooks, Alta.; O. E. Maddsson, Golden Prairie, Sask.; G. R. Marnoch, President of Board of Trade, Lethbridge; Jas. R. Marshall, Alderman, Medicine Hat; W. M. Martin, Premier of Saskatchewan, Regina; O. W. Martyn, Canadian Society of Civil Engineers, Swift Current; Mr. Mabee, Department of Natural Resources, Canadian Pacific Railway, Calgary, Alta.; W. T. Mee, A. A. Meneley, Maple Creek; A. W. Mitchell, Mitchell Nurseries, Limited, Coaldale, Alta.; A. M. Moody, Klintonel P.O., Sask.; Wm. Moore, Carmichael, Sask.; H. Moorhead, Piapot, Sask.; F. W. Morrison, Royal Northwest Mounted Police, Maple Creek; G. A. Morrison, Official Reporter, Calgary; Hon. W. R. Motherwell, Minister of Agriculture, Regina; Mrs. Robert Needham, Robert Needham, H. Needham, Piapot, Sask.; J. McD. Palton, Regina; W. G. Patterson, Battle Creek; John Patterson, Maple Creek; Edward Paulson, Robsart; Wm. Pearce, Statistician, Department of Natural Resources, Canadian Pacific Railway, Calgary; F. H. Peters, Commissioner of Irrigation, Department of the Interior, Calgary; F. A. Peterson, J. T. Pickett, C. E. Pinder, Maple Creek; S. G. Porter, Canadian Society of Civil Engineers, Calgary; G. W. Quick, Mrs. G. Quick, Maple Creek; H. W. Rawley, Vidora, Sask.; Jas. Reid, F. B. Richardson, Maple Creek; Mrs. S. J. Richardson, Councillor, Saskatchewan; L. E. Richardson, Councillor, Saskatchewan; Walter Ricks, Calgary; G. E. Salisbury, T. J. Shearer, S. Smiley, F. J. Smith, Maple Creek; E. A. Smith, Experimental Farm, Ottawa; B. F. Snow, Cardell, Sask.; R. J. C. Stead, Calgary; J. W. Stearns, Dollard, Sask.; G. C. Stewart, Maple Creek; Isaac Stirling, Nashlyn, Sask.; C. H. Stockdale, Maple Creek; R. S. Stockton, Superintendent of Operation and Maintenance, Canadian Pacific Railway, Strathmore, Alta.; J. S. Tempest, Canadian Society of Civil Engineers, Calgary; I. Triplett, Gerald Udal, Maple Creek; S. Unsworth, Piapot, Sask.; Rev. J. G. Vitson, Maple Creek; Geo. Watson, Whiteman, Sask.; I. H. Williams, R. G. Williamson, Maple Creek; D. Wood, Coulee, Sask.; A. Woodburn, G. Woodburn, Robt. W. Woodburn, Jacob Wysong, Maple Creek.

### LIST OF PUBLICATIONS OF THE IRRIGATION BRANCH.

Annual Stream Measurements Report, 1909 to 1915.

Irrigation Report, 1906 to 1915.

Irrigation Surveys and Inspections Report, 1915; (1915-16); (1916-17).

Western Canada Irrigation Association Report (1st to 10th Convention).

International Irrigation Congress Report (1914).

Bulletin No. 1 (Irrigation in Saskatchewan and Alberta).

Bulletin No. 2 (Alfalfa Culture).

Bulletin No. 3 (Climatic and Soil Conditions, C.P.R. Irr. Block).

Bulletin No. 4 (Duty of Water Experiments and Farm Demonstration Work).

#### PAMPHLETS:

Address by Mr. S. G. Porter; "Practical Operation of Irrigation Works";  
Extract from W.C.I.A. Report, 1914.

" " Dr. Rutherford: "Inter-dependence of Farm and City";  
Extract from W.C.I.A. Report, 1914.

" " Mr. Don. H. Bark: "The Actual Problem that Confronts the  
Irrigator";  
Extract from W.C.I.A. Report, 1914.

" " Mr. Don. H. Bark: "Practical Irrigation Hints for Alberta";  
Extract from W.C.I.A. Report, 1915.

" " Mr. Don. H. Bark: "Alfalfa Growing";  
Extract from W.C.I.A. Report, 1915.





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